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ELECTRICAL REVIEW.

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SCIENCE AND INDUSTRY.

IN opening the new buildings at the National Physical Laboratory last week, Mr. Balfour laid aside the politician and assumed once more the rôle of the philosopher, a part for which, by temperament and erudition, he is most admirably adapted. He declared that measuring was the very life blood of physical science, and lay at the root not only of all great discoveries, but also of their application to practice; it followed, therefore, that such work as that of the Laboratory was essential to the prosperity of a great manufacturing country. It could not be done by the manufacturers themselves, as the institution must act in a judicial and absolutely impartial capacity, and, moreover, it was of the greatest advantage that a manufacturer should have at command the services of a staff of the very highest scientific attainments and a first-class equipment without excessive outlay. Further, the objects of the Laboratory included original research, and he wished that a larger proportion of its energies could be devoted to that purpose, for it was to the results of pure scientific investigation, without an eye to the practical applications of its fruits, that mankind was most deeply indebted for all great advances in industrial knowledge and practice.

We have no doubt that there are many who will quarrel with the latter part of Mr. Balfour's address. It is, indeed, impossible to generalise on so complex a subject without over-running the bounds of accurate statement.

For example, it cannot be suggested that such inventions as the steam engine or the spinning jenny were due in the remotest degree to scientific research. They were produced by men of modest attainments to cope with urgent needs, and, like some similar inventions, have exercised a fundamental influence upon the industries of this country in particular, and the world in general. But, on the other hand, it cannot be denied that many modern industries and conveniences are based entirely upon the work of men whose sole purpose was to investigate the hidden mysteries of nature and science for their own sake alone, who sought no profit or material advancement, and who in most cases, to our shame be it said, received no adequate reward for their single-minded and unselfish labours. Such men were Newton, Faraday and Maxwell, to name but three of our most eminent investigators. We of the electrical world in particular are most deeply indebted to pure science, for our whole industry is founded upon it; the dynamo, the telegraph, wireless telegraphy, the Röntgen rays, the electric lamp, were all the direct offspring of pure physical research, and to these might be added many other examples, such as radium and the fixation of nitrogen, all of which have had, or will have, an immense influence upon the future of the human race.

We may, in fact, divide the field into two great areas—that of discovery, on the one hand, which is the object of pure research; and that of invention on the other, which often in the past has been, and still more frequently in the future will be, the indirect result of the former.

We do not doubt that every real advance in physical science will sooner or later bear fruit in applications for the use and convenience of man, and this is the true justification for the prosecution of research. We therefore cordially join with Mr. Balfour in the hope that as times goes on the public will come to realise the enormous importance of pure science, and will provide such an institution as the National Physical Laboratory with ample means not only to carry on its invaluable commercial work, but also to extend its researches freely into every department of pure physics.

Lead.

Some very sharp fluctuations have been seen in lead lately, which were impelled by the heavy selling of an important firm of dealers, and from close upon £22 a ton for early delivery on June 19th, the price collapsed to £19 a ton on June 28th. The cause of the selling on the scale witnessed, fully 3,000 tons having been disposed of on the open market on Thursday and Friday of last week, is something of a mystery, but there were vague and unconfirmed rumours that the Mexican position had been much straightened out. In the absence, however, of definite assurances to this effect, it would appear that there was something behind the selling of which people generally are ignorant. There is, however, just a suspicion that the sales were merely of a "hedging" variety in connection with certain large German producing interests, though it must be granted that the theory is not entirely satisfactory. Rather more lead has become available of late owing to arrivals from Spain, but for all this there is no sign of any accumulation of material, and the overseas demand remains quite good, while large quantities of metal are yet required to complete old contracts. As was pointed out in a recent article, however, the present price of lead is high, and it gives consumers no encouragement to purchase ahead of actual needs.

Trade demand naturally remains restrained under the circumstances, but may possibly awaken, provided the adverse elements which have been weighing upon metals generally be removed. The fact of it is, that at high prices, every commodity sooner or later becomes vulnerable to selling pressure, whether the pressure be warranted by the actual condition of affairs or not. A heavy fall has lately been witnessed in all metals, regardless of merits, and lead has suffered in sympathy with others. Intrinsically there seems to be nothing really amiss, but at the same time, as was pointed out before, "when the news comes that the political troubles in Mexico are over, one of the first things will be a readjustment of lead prices in consonance with the altered position." In the long run high prices are an impediment to trade, and the present tendency is towards a lower level, but all the same for this, so far as lead is concerned, a long view does not encourage high hopes of a very important extension of supplies from producing countries, the world's material coming to a great extent from well-known and well-defined mineral areas, the development of new grounds being comparatively insignificant.

The Broken Hill Proprietary Co. for this year up to June 4th produced 38,149 tons of lead against 35,436 tons last year, and the Sulphide Corporation up to April 17th, 4,720 tons against 7,022 tons in 1911. For the whole of last year the Penarroya Co., of Spain, which for the last half of the year included also the output of the mines and smelters of the Escombrera-Bleyberg Co. turned out 70,595 tons, the joint output of the now amalgamated properties in 1911 being 67,074 tons, while that of the Malfidano Co. in France was 6,709 tons against 7,832 tons, and that of the French Laurium Co. 11,039 tons against 10,253 tons in 1911. The British imports for the five months ended May 31st were 91,417 tons compared with 91,221 tons last year, and 86,467 tons in 1910. The total exports of English and foreign lead for the five months were 26,817 tons against 21,937 tons in 1911, and 28,199 tons in 1910. The following figures show some of the more important movements in respect of supplies this year, so far as they are at present available.

British imports from Mexico, five months, 8,033 tons, against 9,315 tons in 1912 (decrease 1,282 tons); Spain, five months, 31,755 tons, against 37,659 tons in 1912 (decrease 5,904 tons); Australia, five months, 29,904 tons, against 23,627 tons in 1912 (increase 6,277 tons); U.S.A., five months, 11,609 tons, against 13,243 tons in 1912 (decrease 1,634 tons).

Exports from Spain, three months, 51,010 tons, against 43,695 tons in 1912 (increase 7,315 tons); Belgium, four months, 26,957 tons, against 18,475 tons in 1912 (increase 8,482 tons); U.S.A. to Europe (Mexican lead), four months, 13,972 tons, against 18,989 tons in 1912 (decrease 5,017 tons).

News now comes that the Convention for regulating the sale of soft pig lead in Europe has been renewed for a period of three years. The Convention came into being about the middle of 1909, and was to expire on June 30th, 1913, unless renewed by the parties to it. The Convention is between the Broken Hill Proprietary Co., the American Smelting and Refining Co., the Penarroya Co., the Figueira Co. and the Metallgesellschaft. The last-named concern act as selling agents, and take all the lead produced from the mines at the monthly average price given in one of the London commercial newspapers. The average selling price in London during the seven months of the Convention's operations in 1909 was £12 18s. 7d.; in 1910, £12 19s. 1d.; in 1911, £13 19s. 3d.; and in 1912, £17 15s. 10d. The Convention is understood to have been renewed for a period of three years.

Municipal Parsimony.

In a recent issue we referred briefly to the action of the Corporation of Dublin in denying to the staff of its electricity department the due reward of their labours. We make no apology for returning to the subject, for, on further investigation, we find that the decision was even more flagrantly unjust than it appeared at the time.

The chief question was the revision of the salaries of the city electrical engineer, the deputy city electrical engineer, and the chief engineer of the distribution department. It may be remembered that in 1905 the City Council decided to dispense with the services of a consulting engineer, and place the whole of the responsibility for all future work upon the chief engineer, Mr. Mark Ruddle. In spite of the additional burden thus imposed upon him in 1906, the Council only increased his salary by £150 a year, an advance which would have been fully justified by the normal growth of the undertaking, and although engineering fees were saved to the tune of some £20,000 by placing the work in Mr. Ruddle's hands, he has not received one penny in acknowledgment of his special services in a consulting capacity. Moreover, his present salary, £750, is below that paid in other cities where the undertaking is of equal magnitude.

The deputy engineer, Mr. L. J. Kettle, not only effected substantial economies in generating costs, but also assisted the chief in carrying out the extensions of plant, for which extra work he has received no payment; and the distribution engineer, Mr. G. Archer, has likewise received no increase in his modest salary since 1910, although his duties have very greatly increased.

All these and other facts were embodied in the report of the Electricity Supply Committee to the Council, justly recommending a substantial increase in each case; yet the Council decided that the matter should be deferred till December next (which practically means a flat refusal). Surely the men deputed to control the destinies of so important a city should be capable of appreciating the fact that an undertaking representing a capital outlay of £750,000—half of which has been expended under the direction of their own engineer—and requiring the highest technical skill and commercial ability for its successful management, cannot be conducted on the lines of a grocer's shop! An efficient technical staff is essential; and having such a staff, it is to the best interests of the undertaking to make it worth their while to stay. We hope the Council, on further consideration, will realise the facts of the situation, and do justice to those who have brought the undertaking into a prosperous condition.

NOTES FROM INDIA.

[FROM OUR SPECIAL CORRESPONDENT.]

THE Cawnpore Municipality have before them a scheme for the extension of the electric lighting of the city. They propose to accept an offer from the Electric Supply and Traction Co. to erect 800 additional street lights at a capital outlay of half a lac of rupees, the Municipality in turn to remit the track rent charged for the tramlines for a certain number of years. This proposal now awaits sanction of Government.

The Lucknow Municipality are still considering their electric lighting scheme for the city. Several schemes have been drawn up but none have yet crystallized. Years ago there was a military cantonment scheme, which was to eventually embrace the city area. Tenders were actually called for and a sum of money budgetted; but report has it that Lord Kitchener diverted the money to some other channel. Subsequently a special engineer was sent to work out another scheme for the city only; this, apparently, was pidgeonholed. A third attempt was made last year, and a company willing to take out a licence under the Indian Electricity Act was formed and its proposals were put up before Government, but as yet nothing definite has been arranged. There are several private installations within the Civil Lines, and most of the big Government officials' houses are connected up for fans and lights, hence, possibly, the half-hearted and free and easy way that the city lighting scheme, which eventually must come, is progressing. To illustrate how points are stretched to meet the convenience of high officials, it may be noted that the Chatter Munzil Club installation, which is 110 volts pressure, is about to supply current to the Nazul Offices which are at least a mile distant.

According to the *Calcutta Statesman*, the Port Commissioners are placing an order with Messrs. John Grieve and Co. for five electric cranes for the new No. 9 jetty, at a cost of £3,700, f.o.b. Glasgow. In the sanctioned estimate for the new jetty berth a sum of Rs. 60,000 was included for five hydraulic wharf cranes, but it was subsequently found that without extending the hydraulic installation there would not be sufficient power to work these cranes. Tenders were accordingly invited locally and through the London agent for five electric cranes with luffing jibs. The chief engineer recommended the acceptance of the lowest tender, that of Messrs. John Grieve & Co. This firm had already supplied the Commissioners with the three travelling electric yard cranes at berths Nos. 7 and 8, which were working very satisfactorily.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Prevention of Accidents in Electric Lifts.

Mr. Harmsworth's remark that the locks manufactured by his firm "reach all the requirements of practical safety," remind one of Kant's famous philosophical breakdown! Kant, is will be remembered, threw over "pure" reason when such became inconvenient, and turned to his doctrine of "practical" reason.

Mr. Harmsworth, it appears, gives up "absolute" safety, presumably because such has been difficult of attainment, and takes up "practical" safety. It is surprising that a firm such as Messrs. R. Waygood & Co., who have been so long in the field, should be satisfied with a lock which is not, as plainly acknowledged by Mr. Harmsworth, absolutely safe. "Practically" safe is not near enough, and a good lock should not allow even of unlikely contingencies, as apparently, from Mr. Harmsworth's remarks, Messrs. R. Waygood & Co.'s lock does.

Mr. Barlow mentions the number of springs included in this lock, but the total number of parts is—well—astonishing! Mr. Barlow has already emphasised the objections against the unlocking of the gate when the cage passes. This is a real source of danger, and must not be allowed to be covered up (notwithstanding Messrs. Smith, Major & Stevens's great "umbrella" illustration!) on account of its not being taken into account by most of the locks now on the market. Many locks now fitted fail utterly when called upon to open a 400-volt circuit while the lift is running, as an arc is drawn between the contacts, with the result that the lift continues to run with the gate open.

It is to be regretted that Messrs. Smith, Major and Stevens (and others) do not realise these points, but even if they consider the unlocking of the gate as the cage passes an "irritating annoyance," one would think that one of their many improvements would include as standard practice a means to overcome this nuisance. But apart from all this, I am willing to grant that "until a few weeks back" the lock covered by patent No. 2,766 was the best on the market, and is now second only to the one which has been much referred to by myself.

W. J. F. Cooper.

London, *July 1st*, 1913.

The danger that appears to be so obscure to Messrs. Smith, Major & Stevens is mentioned quite clearly by Mr. Carroll and by Mr. Barlow in your last (27th inst.) issue, and arises from just that succession of gate-securing operations which Messrs. S. M. & S. claim to have pioneered eight years ago—viz., "first, latching; secondly, closing the switch; and lastly, counterlocking."

I hold that "closing the switch" should come last in order of time, for the obvious reason that if this is made rigidly subsequent to the counterlocking, and the counterlock fails to act, then the switch cannot be closed, and nothing more serious than a stoppage of the lift will result.

The opening of the landing gate when the lift is passing is certainly in itself more a nuisance than a danger, but is it not clear that a lock that allows this to happen must be of such a type that its mechanism might fail to lock the gate when the cage moved away from the landing, owing, perhaps (as Mr. Carroll points out), to a broken spring or a bent or otherwise jammed spindle?

Mr. Harmsworth mentions the nuisance of the lift being stopped by anyone pulling on the gate. His remarks on the danger referred to above would be interesting.

Helicon.

London, S.E., *June 30th*, 1913.

Proposed British Engineering Staff Association.

I agree with "Vertebra" in your current issue. "Box Numbers" are often an infernal nuisance. I agree with Mr. Douglas, but suggest that the proposed Association should be for defence, and not for offence. But one is bound to pause when "W. E. P." infers that the use of such an Association is questionable, for is not all evidence quite the other way? Indeed, modern life tends ever towards co-operation—religious, political, industrial. The engineering employers were not by any means the first to recognise the value of such unity, but their recently-formed B.E.A.M.A., I.M.E.A., and the Electrical Contractors' Association, are hardly monuments to its principles. Perhaps "W. E. P." is himself a manufacturer. His suggestion that our objects could be attained in the hands of the I.C.E., I.M.E. and I.E.E., almost indicates so much.

Do let us keep to our aims. The proposed Association is for the mutual *protection* of engineers—mechanical, civil, electrical—and will specially concern those gentlemen who are attached to the staffs of manufacturing firms. Such combination has been expedited by the belief that our employers have it now in their power to minimise salaries, and to dictate as to where and when, and how an engineer shall be employed. Letters in your recent issues have made that clear.

I understand it is proposed that membership of the Association be confined to those mechanical, civil and electrical engineers who, in general, have had an engineer-

ing training as pupils in some recognised college, school, or consulting office, or in an engineering or electricity works. Special cases could be considered on their merits, since there are not a few engineers in responsible positions, who have had neither a technical nor practical pupilage in the accepted sense of the term. And this latter class could very well include draughtsmen, many of whom are so closely associated with engineers, and are capable of filling good appointments. It would seem inadvisable to exclude such gentlemen solely because they have no proof of such training; but that could be for the official committee to decide. It is the writer's personal hope that a separate section will be formed on their behalf. Honorary members who approve of, and wish to promote, the objects of the Association might also be admitted, minus the voting power of the ordinary member.

As to subscription, Mr. Douglas gives a fair rate. At present, the probable amount of this may tend to prompt certain gentlemen to withhold their support. Thus the subscription should be kept as low as possible, probably ranging downwards from a maximum of one guinea per annum. Engineering students and apprentices might even be admitted without voting power at about 5s. per annum, as the benefits they could receive from the Association later might be proportional to their length of membership.

When one considers Mr. Fletcher's suggestions, which you were good enough to print in your recent issue, the Association should soon find itself busy. Its secondary aims alone leave much to be attempted. Always, of course, it must do its utmost to maintain and to improve the status of its members. A bureau could be formed to give information free of cost to members regarding firms and working conditions at home and abroad, supplemented by a list of appointments vacant and required. Such a list should be of equal use to employers also. Free professional, legal and patent assistance should likewise prove of great benefit. There is no doubt that a patentee would welcome such help, and perhaps the wide resources of the Association could facilitate the best sale of his rights.

Whether the Association could successfully maintain remuneration proportional to the duties and responsibilities of its members remains to be seen. It should certainly try to eliminate some of the wretched salaries which are offered, often enough without justification. There might even be a written or an unwritten rule that no member should accept a position, incompatible with his knowledge and previous income, until he secures the advice of the Association. A good deal might also be done to promote social intercourse, so beneficial to certain engineers.

At first the Association could scarcely be expected to give much monetary assistance to its members. But this consideration is equally important. If possible, the funds might grant special emergency assistance at least without interest. Financial help might also be given to those who happen to be disengaged. The amount distributed in this way by Continental Associations is, I believe, appreciable; but all such considerations will doubtless be investigated by the proper Committee.

In conclusion, I would urge all prospective members to send in their names at once, mentioning their firm, to Mr. Fletcher, the hon. secretary, at 31, Queen Victoria Street, London, E.C. Don't "wait and see." Support the movement at the outset, and make the best start. And please don't expect a reply by return. It will take some time to acknowledge all letters received.

A.M.I.E.E.

June 30th, 1913.

My attention is drawn to a short leader in Friday's *Electrician* in respect of a letter which appeared recently in your own columns. Merely by way of comment thereon, perhaps you will be good enough to let me say that what was "suggested" by a previous correspondent would now appear to have become an "allegation" of my own. I am afraid I fail to see just why it should, and presume that the misconstruction was simply an oversight. Nor can I imagine how the *Electrician* justifies its apparent contention that the score or so of gentlemen who are most keenly interested in the inception of this Association, should seek to endanger their position, prospects and private resources by "disclosing their personality," and by proof of this or that at this stage.

It is likewise noteworthy that your contemporary would appear to infer that proof of the everyday actions on the part of our industrial "rings" can be set down readily in black and white. When you yourself so obliged us by the publication of my letter, it was surely obvious that, for some time at any rate, it was desired to guard the "names and addresses" of those responsible gentlemen who are leading the movement. Perhaps you even appreciated the view that up to now our employers have not been expected to encourage such federation, and that an attempt to prove or to disprove anything at present would be altogether too risky.

With all respect, one can only hope that the *Electrician* will be patient for another month or so. At the same time, I am instructed to say that we will reply as soon as we can to all the gentlemen who have so kindly written to us.

L. H. Fletcher,
Hon. Acting Secretary Proposed Association.

31, Queen Victoria Street, London, E.C.
June 30th, 1913.

A Wiring Job.

I think the following may prove of interest to you. An electric lighting contract recently executed in the suburbs of London, under the supervision of consulting engineers, has been carried out in the following manner: Steel tubing from switch boxes is sunk in the walls and carried up into the roofs, then wood casing is used, and in order to save cable three-plate ceiling roses are fixed to the casing and used as connectors. Now can you wonder at fires occurring as long as this is allowed? The same thing applies to work done in subways on this job. The tube is not bonded.

A. H. Marshall.

London, E., *June 27th*, 1913.

A Preposterous Requirement.

I have just completed a country house job. The voltage is 25; I ran V.I.R. cable from dynamo to switchboard, on porcelain cleats.

The fire insurance company concerned now require this to be put in steel conduit, and, moreover, the *conduit must be kept 2 in. clear of all woodwork.*

Considering that conduit is universally run on wooden joists throughout the country, I look on this as a piece of sheer wantonness. What do your readers think?

I know this, that I shall carefully inquire beforehand in future as to which insurance company is concerned, and in any case in which the policy is taken with this particular company, I shall quote substantially higher than otherwise, with a clause making a good reduction should my customer change over to a more reasonable company.

A. O. G.

Electrolysed Sea-Water for Public Baths.—The water of swimming ponds which are frequented daily by many bathers becomes highly charged with bacterial organisms as a result of such use. A freshwater pond containing 100,000 gallons in use for one day only, but which had been used by 380 bathers, contained 342,400 bacteria per cubic centimetre of water at the end of the day, the average number of bacteria in the clean water used to fill the pond being less than 500 per cubic centimetre. Poplar last year produced and distributed 53,063 gallons of electrolysed sea-water, costing about £2 per 1,000 gallons, and so efficient is it in its sterilising action, that 30 gallons added to a swimming pond of 85,000 gallons capacity on first filling, together with subsequent additions at intervals of two or three days, is sufficient to keep the water clear and free from noxious bacteria. The fluid is stable, non-caustic, non-poisonous, and harmless to the fabric of clothes.—*Medical Press.*

Maturing Cheese by Electricity.—An industrial electrician of Rotterdam is reported to have discovered a method of giving age to cheese by means of electricity. He takes a fresh cheese and subjects it to an alternating current. At the end of 24 hours it is said to possess all the properties of a fine two-year-old cheese.—*Grocery.*

THE ELECTRICAL WORK AT THE NATIONAL PHYSICAL LABORATORY DURING THE YEAR 1912.

ON Thursday last week the new buildings, consisting of laboratories for metallurgy and optics, and an administration building, completing the scheme planned in 1909, were formally opened by Mr. A. J. Balfour, and afterwards the visitors inspected the new buildings, and were entertained with light refreshments.

The extensions have been erected at a cost of some £35,000, of which £15,000 was contributed by the State, and £10,000 by the late Sir Julius Wernher, supplemented by further contributions from Lady Wernher, £5,000 from the Commissioners of the 1851 Exhibition, and sums received from the Drapers' Company and others. At least £5,000 is still required for the necessary equipment.

Sir Archibald Geikie, President of the Royal Society and Chairman of the General Board of the Laboratory, presided at the opening ceremony; Dr. Glazebrook, Director of the Laboratory, briefly explained the purpose of the new buildings and the necessity of further donations, remarking that from the commencement the Board had pursued a policy of faith in the future; and Lord Rayleigh added further particulars. Mr. Balfour in his speech emphasised the necessity of exact measurement, to enable our manufacturing industries to keep pace with those of our rivals; he explained also that it was essential that the Laboratory should be conducted by an entirely impartial management rather than by the manufacturers themselves, and strongly urged the importance of research in pure science, to which all great advances in industry were due. Col. Seely proposed a vote of thanks to Mr. Balfour in terms of the highest eulogy, and expressed the indebtedness of military aviation to the Laboratory for discoveries which had undoubtedly saved the lives of many brave men.

The visitors afterwards broke up into parties to inspect the various departments. Interesting work was in progress in the electrotechnical sections, to which we shall refer at a later date when the results are available for publication. In the meantime, we subjoin an account of last year's work as given in the annual report of the Director.

The Lorenz apparatus was completed during the year, and a number of resistance measurements have been made by means of it. The measurement of the dimensions of the four coils was undertaken, the results showing the coils to be very nearly circular in cross section, the maximum difference between the diameters in any one plane being about three parts in 100,000. All of the coils are slightly conical, the difference between the mean diameters of the ends amounting to about one part in 10,000. The change in the dimensions of a coil was determined when currents of 1 and 2 amperes were passed through it for a period corresponding to that employed in a measurement of resistance by means of the Lorenz apparatus. The results are of considerable interest, and show that it is necessary to take the expansion into account when precision measurements are being made. Constancy of speed is obtained by applying a variable pressure on the fly-wheel, the pressure being such as to maintain constant the position of a galvanometer spot; the galvanometer is joined across a Wheatstone bridge in one arm of which is a condenser, the latter being charged and discharged by a commutator fitted on the axle of the driving motor. Referring to the resistance measurements, in those so far made, the probable error of any single measurement appears to be of the order of two parts in 100,000, and the accuracy ultimately obtained will be considerably in advance of that hitherto reached.

Five mercury resistance tubes were constructed to serve as standards for the Japanese Government, and nine for the Laboratory, showing results consistent within two parts in 100,000. Comparisons with the resistance standards of the Bureau of Standards, the Reichsanstalt and the Laboratoire Central d'Electricité have been made during the year, the maximum difference between the standards of the four laboratories being 11 parts in 1,000,000. The results indicate to what degree electricians throughout the world may now feel certain of making resistance measurements on a common basis.

Evidence in favour of the Weston cell being slightly unstable is to hand, and old cells cannot be used as standards of E.M.F. in precision work; it is, therefore, necessary to set up cells at regular intervals and reject those in which hysteresis occurs or which are found to be decreasing in E.M.F.

During the year a full description has been published of the experiments in which the ohm was evaluated in absolute units by two A.C. methods, and it was found that the ratio of the international ohm to the true ohm was 1·00026 with a probable error of 1 part in 10,000.

In connection with an investigation on power factors of condensers, many tests were made of the variation of effective capacity with frequency, using the Carey Foster method, in which the results are referred directly to a standard mutual inductance, and are not merely relative to an air condenser. Some of the mica condensers showed only a very small change in capacity between frequencies of 100 to 2,000 cycles per second. For example, in a mica condenser presented to the Laboratory by Mr. H. W. Sullivan, the power factor at 100 cycles per second was less than 0·0001, and the capacity showed a change of less than 1 part in 10,000 for a change of frequency from 100 to 800 cycles per second.

The research on the errors in magnetic testing caused by bending test sheets was carried further, and the results have been published. Experiments were made on several different kinds of magnetic sheet material with a view to determining the direction of maximum permeability. With all the samples tried this direction was in very close coincidence with the direction in which the sheet had been rolled.

In connection with the photometrical investigation, the set of 24 tungsten sub-standards running at 1·5 watts per candle has now been satisfactorily established. The C.P. values now assigned to these lamps have been determined by a "cascade" method by six different observers, the work having been in progress for about three years. In the cascade method it has been found that mechanical errors and those due to the changes of observers from day to day have given rise to a probable error of 0·08 per cent. Assuming that the six observers may be taken as representative of persons with normal sight, the probable error of the final results is 0·25 per cent. A set of measurements in which the comparison was made of the Fleming standards with the 1·5 watts per candle tungsten standards in one set step, gave agreement with the cascade method to within 0·27 per cent., but the variations of individual observers from the mean were greater than with the cascade method.

A large number of comparisons were made with the pentane lamp burning in an atmosphere of about normal humidity, and although by reason of the absence of extreme values the correcting factor for humidity could not be accurately redetermined, the value of the unit was reproduced to a high accuracy. The result shows that the candle-power unit determined in 1904-5, and maintained constant by means of electric sub-standards, is in agreement with the newly-determined unit to within less than 0·1 per cent. This close agreement is better than was anticipated, and confirms the contention that a candle-power unit may, if proper precautions are exercised, be held constant by means of electric sub-standards over long periods of time. Comparisons with Germany and America indicate that the photometry of lights of different colours need not be liable to the errors commonly supposed to be associated with it.

In connection with the consideration by the Engineering Standards Committee of a specification for metal-filament lamps, a great number of life tests were made during the summer with a view to obtaining data regarding the life performance of present-day tungsten lamps. About 160 lamps of different ratings and makes were run at voltages which gave certain definite values of initial watts per candle. By this means it was assured that all the filaments were operating at approximately the same temperature, and the data obtained give information on two points:—(1) The rate of C.P. drop during life corresponding to the watts per candle values at which the test was run; (2) The tendency for "burn-outs" of filaments to take place before reaching the 1,000 hours. The latter of course depends considerably on the thickness of the filaments, and is greater for high than for low-voltage lamps. The investigation forms the subject of a complete report to the Engineering Standards Committee, which has since been published, together with about 80 diagrams, giving full details of the tests. The report also contains results of the tests for initial rating of about 800 lamps obtained in batches of 25 from different sources. These measurements give data as to the degree of uniformity which exists in the individual lamps in consignments from different makers supplied to customers in the usual manner.

A full description of the methods and apparatus used for precision A.C. measurements has been embodied in a paper by Messrs. Paterson, Rayner and Kinnes, which was read before the Institution of Electrical Engineers.

An investigation has been made for the Engineering Standards Committee on the heating of screw socket lampholders. Bayonet holders are not satisfactory when the watts transmitted exceed 250, and some other type of holder has to be used for larger units. The heating of a lamp socket is almost entirely due to the heat dissipated by the lamp or radiator, and has little to do with the energy lost at the contacts, the latter being a negligible quantity, unless the holder becomes defective. Screw sockets are not open to the objections of bayonet holders, and can satisfactorily transmit amounts of power up to 1,000 watts. The ordinary, as well as the Goliath, screw sockets were tested under different conditions, the temperature reached being as high as 120° C. for certain sockets. There seems to be no special objection to these temperatures as far as concerns the sockets themselves, but the effect of the heat on the insulation of incoming cables is likely to be serious. Tests made on the temperature gradients along the cables entering the sockets indicated that some modification of design is desirable where large lighting units are being dealt with.

Investigations have been made on the compressibility of micanite in connection with its use in localities where the heat is sufficient to soften the varnish. The relationship was examined between the compressibility and the amount of varnish, and experiments were made to ascertain the effect of additional heat treatment. The

investigations show generally that, to avoid an undue amount of compression, the quantity of varnish in the material should be controlled. Heat treatment above that required to give good moulding plate will tend to reduce the tenacity of the varnish and render the material liable to flaking.

The data obtained in the investigations of the electric strength of ebonite have been embodied in a paper to be published by the Institution of Electrical Engineers. The general result shows that ebonite of the best quality will withstand a voltage gradient of 125,000 volts per mm., and that comparatively simple physical tests are applicable to show whether the material is of high-grade quality.

In connection with the testing of some small electrolytic meters —a type of instrument which requires to be tested over a long period—the experiment was tried of using a small copper voltameter to integrate the current instead of the more usual methods of keeping the current steady or of taking the mean of a large number of readings as the current value. The method is, of course, well known, but little used in practice, and attention is called to it as a means of testing small house service meters where such tests have to be made in position. By observing proper conditions as to the electrolyte, the work involved in setting up and weighing the plates is very small. Determinations can be made readily to within 0·3 per cent., while the possibility of personal error in the determination is at least no greater than with the methods more generally used.

A paper was read before the Institution of Electrical Engineers giving the results of the investigation into the behaviour of D.C. watt-hour meters. The results obtained in the laboratory with all the meters, when on a rapidly fluctuating load, were in close agreement with those obtained on a steady load.

These results were confirmed by observations extending over three weeks, during which time the meters were connected in the traction circuit of the Sutton generating station. The observations under these conditions were carried on in all for a period of eight months. The latter observations indicated that some of the meters were changing; the differences in the readings, after they had been corrected by the previously determined constants, amounted to as much as ± 3 per cent. from the mean of the six meters. On their being brought back to the laboratory for examination, it was found that while the change in three of the instruments was not greater than ± 1 per cent., one had increased in rate by 2½ per cent., another by 3 per cent., and the sixth by a further 2 per cent., making for this last meter a total change of 6 per cent. during the period covered by the whole series of tests.

A further question that arose during the above investigation, relating to the permanent change due to momentary excessive loads, was fully investigated. Very large changes were found in several of the meters as a result of subjecting them to a current approximating to that to which they would be subject when a short circuit occurred. These changes were found to be due mainly to demagnetisation of the brake magnets, or to magnetisation of parts of the meters. It was found possible to obviate them by using a shield of proper size and material. In one type of meter the shield supplied was removed and replaced by one built up in the laboratory of sheets of Stalloy iron, the result being that the change in rate due to a short-circuit current was only ½ per cent., as compared with from 2 to 9 per cent. with the original shield.

The work being carried on at the request of the Wiring Rules Committee of the Institution of Electrical Engineers to determine (*a*) the heating of flexible cords, and (*b*) the ageing with high temperatures of standard paper and rubber-insulated conductors, has progressed well during the year. Regarding (*a*), the heating due to the current flowing has been determined for a number of wires with different types of insulation and covering, extending over the whole range of flexible wires in general use. In addition, a number of tests were made in order to obtain an idea of the extent of the heating due to radiation from a lamp suspended by the flexible wire, and by conduction from the lampholder. The heating was found to vary greatly with different types of shade and methods of fixing. Regarding (*b*)—the ageing of standard insulated conductors—preliminary investigations have been made with a length of rubber-insulated cable, and with the oil and paper used for paper-insulated cable. Samples have been exposed in an oven to various temperatures, the effect on their mechanical and electrical properties being noted.

The report contains a summary of the researches to be carried out during the present year, as well as a list of the papers published during the past year.

LEGAL.

BELL *v.* MILNE.

(*Continued from Vol. 72, page* 1058.)

PURSUER, in the witness box, said he had been electrical engineer of Aberdeen since 1898. He acted as adviser to the Town Council in several big schemes, and from time to time he had advised the city architect as to the wiring of public buildings. That had been done with the knowledge of the Town Council or the Convener of the Committee for the time being. In his efforts to get consumers he had reached a point where there had been a set-back to him, namely, in the wiring of houses. It was an essential and elementary requirement on the part of an electrical engineer in his position that he should have a thorough knowledge of electrical wiring. His two principal assistants were also experts in wiring. He detailed the advice which he and his assistants had given to Mr. A. B. Robertson in regard to the electrical installation at Murtle Hydro recently, and said such instances of advice given to parties might be multiplied. Witness was responsible to the Town Council for carrying out the Board of Trade, Home Office, and Cinematograph Acts Regulations, and the Town Council supposed him to be competent in regard to wiring specifications and the wiring of public buildings under the control of the Town Council. They had recently had a large number of instances in Aberdeen of installations which brought out the average wiring rate at somewhere between 10s. 6d. and 11s. 6d. per point. There were in Aberdeen 35 contractors who did electrical work and dealt with the Corporation mains. Fifteen years ago, there were only 10 doing that sort of work. The cost of wiring houses was fairly standardised throughout the country. The minimum wage in Aberdeen was 7½d. per hour. In these days it was absolutely essential for the development of the electrical department, that his department should give all assistance possible to intending consumers. The Town Council recognised that, and had opened a showroom. The contractors themselves had come and asked his advice upon matters. A large proportion of the Town Council had come to the department for advice in wiring. Referring to the incident out of which the letter arose, pursuer said that about November 22nd, 1912, Mr. A. Davidson, Broomhill Park, Aberdeen, called upon him and asked two questions—first, could he give heating and lighting in his house from the same wires and the same meter, as was common in Dundee? Secondly, would the department draw up a specification for lighting his house as was done in Dundee? Pursuer said the regulations did not permit of his complying with Mr. Davidson's first request, but he said he would accede to the second, which was quite consistent with the regulations. Mr. Davidson said he had received an offer which, in his opinion, was too high, and asked pursuer's opinion about it. Witness did not know who the offerer was, but he agreed the price was too high. He told Mr. Davidson that he had come down in a car with an Aberdeen contractor, with whom he had discussed the question of wiring rules. When Mr. Davidson told him the name of the contractor, pursuer remarked that it was a curious coincidence that he had just been talking to Mr. Robertson, jun., saying he thought it was a mistake for contractors to keep up the price of wiring. Pursuer told Mr. Davidson that wiring ought to be done for 12s. 6d. to £1 per point. Messrs. Robertson's figure worked out at above 25s. 9d. per wiring point. Pursuer told Mr. Davidson that he thought the price was excessive. In a minute of the Electrical Contractors' Association of November, 1912, it appeared that Mr. Robertson submitted a letter he had received from Mr. Davidson which contained certain imputations by Mr. Bell against the firm's honesty.

MR. COOPER: Did you make any imputations against Mr. Robertson's honesty?—None whatever.

Continuing, Witness said Mr. Davidson asked for tenders, which were received from three contractors, as follows:—Messrs. Robertson, £1 1s. 11½d. per point; Aberdeen Electrical Engineering Co., £1 1s. 2½d.; and Mr. A. D. Gillespie, 8s. 6½d.; the last-named was accepted, and the work, when completed, was approved by the electricity department. Pursuer received a letter from Mr. Falconer, advocate, alleging that he had make certain slanderous statements against the firm of Messrs. A. B. Robertson, and threatening an action for damages. Pursuer instructed his agent to accept service of any summons, but to date he had received none. When he saw the letter of Mr. Milne he thought it was distinctly reflecting upon his business ability. He did not think his employers would keep him on if his knowledge of electrical contracting work was very elementary. He thought it was most important that he should, so far as possible, see that the cost of wiring was kept within moderate limits. That was the position he had adopted all along.

MR. COOPER: What is your view of the letter so far as it affects you?—I consider it accuses me of incompetence in my business, and of making slanderous statements against contractors, which I did not. It also speaks to my employers of my actions being intolerable. It hurt my feelings very much.

Cross-examined by the DEAN OF FACULTY, PURSUER said he recognised it was part of his duty not to engage in professional business of any kind unless by sanction of the Town Council.

You have no personal experience of costing work?—No.

Therefore that does not fall within your professional duty?—I suppose not.

Then when it is said you have only an elementary knowledge of contracting work, is not that quite true?—No. I take contracting work to be very much larger than that.

Have you at any time in Aberdeen done any private wiring?—I have drawn up specifications for public and private houses.

HIS LORDSHIP: Allow me to put the question. Have you ever done any wiring in connection with public buildings?—I have never wired with my own hands.

A lengthy cross-examination followed on Mr. Davidson's letter to Mr. Robertson.

THE DEAN: Don't you think the impression conveyed to Mr. Davidson was that he was being charged 22s. when he could get the same work done in Edinburgh for 12s. 6d?—He got the same work done for about 8s. 6d.

We shall see about that. Do you suggest that this is not seriously interfering with the contractor's business?—No, I don't.

THE DEAN remarked that he did not agree with the pleading by pursuer that the Electrical Association was a Trade Union. Quoting

from pursuer's pleading, the Dean read:—"The members of the Association were actuated by ill-will against pursuer, who had frequently had to call attention to the extortionate charges made by Aberdeen contractors." The Dean asked: Was this of Robertson's one of the occasions when you were pointing to extortionate charges?—Yes.

Then you were representing to Mr. Davidson that Messrs. Robertson were making extortionate charges?—I said it was excessive.

Pursuer said it was the fact that tenders were taken from Aberdeen contractors for the City Hospital installation, and the lowest offer was £610. He advised the Town Council that £400 was enough for the contract. Ultimately outside tenders were taken in, with the result that they were all higher than £610, and £610 was ultimately accepted.

The DEAN: What damage do you complain of having suffered? You are still in the service of the Corporation and enjoying their confidence.—The Council have not considered the letter yet.

MR. BELL was fully three hours in the box. He was followed by—

DR. GORDON, town clerk, Aberdeen, who said that when he saw the letter complained of, he formed the opinion that its terms were such that he could not put it before the Town Council. The meaning he took out of the letter was that Mr. Bell was making charges against contractors and threatening their honesty, and he considered that that part of the letter was libellous. He also thought the letter contained a reflection upon Mr. Bell's professional skill.

Do you say that the Town Council ever had any reason to doubt Mr. Bell's efficiency in anything relating to his work?—None.

Continuing, the Town Clerk said a meeting of the Committee was held on December 30th. He submitted the letter which he had received and explained to the Committee that proceedings had been taken by Mr. Bell since the letter had been received, and he suggested to the Committee that in the circumstances the letter should not be considered or discussed. The Committee, however, decided that the letter should be read, and after that had been done they agreed that it should be allowed to lie on the table in the meantime.

LORD PROVOST MAITLAND, who was next called, said that as far as he had been able to observe, Mr. Bell had managed the electrical undertaking very successfully. He never had the slightest reason to doubt his fitness for any branch of the work he had to do. Since pursuer came to be engineer, the output had increased from about 400,000 units, till now it was nearly 8 million units. Mr. Bell had again and again received increases in his salary. His opinion of the letter to the town clerk was that it contained very strong language about the head of the electricity department, and about a servant to his employers. Although he did not believe either of the charges, he regarded them as being very serious imputations against Mr. Bell.

I think there are certain friends of the contractors in the Town Council?—Yes.

Did you think they were likely to seize upon a letter of the sort, and use it against Mr. Bell?—I thought it quite likely.

Cross-examined by the Dean of Faculty: Who did you mean by the friends of the contractors?—One is Bailie Robertson, who is a member of one of the firms that complained of the conduct of the engineer.

Do you put it that it is the duty of a city official to say to citizens of Aberdeen about a tradesman of Aberdeen that he charged double the price for work that could be done cheaper elsewhere?—In my opinion it would be Mr. Bell's duty in the interests of the department.

MR. THOMAS GIBB, convener of the Electricity Committee, said he thought the contents of the letter were scandalous. He had spoken to Bailie Robertson about the letter. Bailie Robertson said that he would never be satisfied until he gave notice of motion to have Mr. Bell dismissed, or words to that effect.

By MR. WILTON: Witness did not know that in June last year the Council instructed Mr. Bell to discontinue the practice of giving estimates.

TREASURER KEMP said Mr. Bell was always fair and quite disinterested in his administration of electricity affairs. One of the first things pointed out to Mr. Bell when he was appointed was that the public of Aberdeen must necessarily be dependent upon him for guidance and assistance. It was in the interests of both the Corporation and the electrical department that Mr. Bell should give such advice, and he considered this a very material part of the engineer's duty.

MR. JOHN FINLAY ANDERSON, plumber, said he was president of the Electrical Contractors' Association. In December of last year Mr. Davidson, Broomhill Park, called upon him and asked him if he would tender for the job of wiring his house. He declined to tender. He assured Mr. Davidson that he knew nothing about any feeling which existed with regard to intervention by Mr. Bell in the matter. He called on Mr. Gillespie to see if he had not made a mistake in his tender for Broomhill Park.?

In cross-examination, Witness said there was never any concert between the members of the Association to keep up prices. There was no "ring," and never had been one. Detailing the circumstances which led up to the Association meeting, at which it was remitted to Mr. Milne and himself to write the town clerk, he said he approved of the letter, which expressed his honest opinion. The Association never had in their minds the Trade Disputes Act. He did not think there was any suggestion that the letter was written in the name of the Association in order to protect Mr. Robertson against a charge of slander. They all considered Mr. Bell a first-class engineer, but they maintained that he did not know about contract work. They had never any idea of reflecting upon the capacity of Mr. Bell. Witness admitted moving that a jobbing price list be made up by a committee. The object was to regulate the jobbing prices in Aberdeen.

ALEX. DAVIDSON, solicitor, Broomhill Park, Aberdeen, stated that he wrote Mr. Robertson, jun., asking him to let him know the cost of electric lighting. Mr. Robertson sent him a specification, and offered to do the work which he specified for £104. A Dundee friend who had experience said the price was too dear, and advised him to go to Mr. Bell, as that was the practice in Dundee. Mr. Bell thought the charge for wiring was too dear. He also expressed the view that it was detrimental to the interests of his department that the Aberdeen contractors should make a practice of charging high rates. Mr. Bell told him that rates were lower in the south, and were as low as 12s. 6d. per point. He undertook to draw up a specification in order that he (witness) might get tenders. In November, 1912, he wrote a letter to Messrs. Robertson, in which he reported the result of his interview with pursuer. In the course of his letter he stated that Mr. Bell spoke strongly on the cost of installation in Aberdeen, and that he (witness) did not grudge a fair price for a good job such as, he was sure, Messrs. Robertson would do for him; but if, as Mr. Bell told him, the work was done, and well done, in Edinburgh for 12s. 6d. per point, while Messrs. Robertson's rate was 22s. per point, he had no choice but to take in competitive offers. He understood when he used the expression "moderately fair," that the price charged by Aberdeen contractors was unduly high, and that the Association was attempting to keep up the price. Mr. Davidson then detailed how he received other tenders and accepted that of Mr. Gillespie.

JAMES A. ROBERTSON, electrical engineer for the burgh of Greenock, said he considered a knowledge of wiring would be very necessary to the chief engineer of a burgh, in view of the fact that he had to pass the installations before connecting them with the mains.

In reply to counsel, Witness said the wiring of the City Hospital was of a simple form, and from his experience he would say that an installation of that sort could be carried out for 9s. or 10s. per point. That would give a fair profit to the contractors. At that rate the cost of the wiring of the City Hospital would be £400, £420 or £430.

Regarding Messrs. Robertson's offer for Broomhill Park, Witness said he had had 20 installations carried out in wood casing during the last 12 months, and the average cost over the whole 20 installations was 11s. 7½d. per point, including "on cost" charges of 15 per cent., allowance for profit, highest over 16s. 8d. per point and lowest 7s. 9d. In shop work the cost was less and in houses it was higher. He considered a charge of 25s. 9d. per point most unjustifiable, except under the most extraordinary conditions, which did not prevail in the case of Broomhill Park.

You know that this contract works out at about 8s. 4d. per point, excluding all fittings?—I think that it is a very low figure, considering that it is a private house, and that there is work to be carried out which cannot be accurately estimated beforehand. I think 12s. to 14s. might have been a very fair price. Taking the class of work into account, he considered that the job was fairly well done. It was above the standard for wood-casing work.

Answering the Dean of Faculty, Witness said in Greenock they claimed that they were not in competition with the contractors. There was a strong feeling in the Town Council that they were not to compete with contractors, and they made a point of not coming in to offer for free wiring in any installation where a private contractor was also tendering to fit the wiring. In Greenock they fitted up between 70 and 80 installations last year, and he should say the contractors fitted up about 200.

Asked what he had to say regarding a statement that the cost of wiring houses for electric lighting might be taken at from 12s. 6d. to £1 per light installed, that figure including ordinary plain fittings and everything else required, Witness said he agreed with that. Steel tubing work could not be done under 17s. The Corporation could not do work cheaper than contractors, for the reason that the labour question was more pronounced in the Corporation than among private contractors. The Corporation had to pay the men maximum wages, and had also questions asked as to the amount of work turned out.

GERALD WALKER CRAWFORD, consulting engineer and a member of Edinburgh Town Council, was the first witness for defender. In his opinion a knowledge of electrical contracting work was not necessary for the due discharge of the duties of one holding an office such as Mr. Bell did. His duties were of a totally different nature. He did not consider a knowledge of contracting work of any importance at all to a municipal electrical engineer. The price of wiring a house or shop in Edinburgh was from 18s. to 20s. per point. For a house such as Broomhill Park he did not consider anything under 30s. would be out of place. He never heard of work being carried out in Edinburgh at 12s. 6d. per point. He never heard of a case of a municipal electrical engineer interfering with the prices between private contractors and consumers.

Cross-examined, MR. CRAWFORD stated that he had never done contracting, and had never done wiring himself.

THOMAS WRIGHT, electrical engineer, Glasgow, described Mr. Robertson's price as very fair, and a little under the average.

Answering MR. COOPER, Witness said they had jobbing price lists in the Glasgow branch of the Association.

MR. COOPER: Is it the case that the average cost to the consumer, including the profits of wiring in wood casing, is 13s.?—13s. is about the lowest figure that ever I quoted work at.

ALEX. PRATT, electrical engineer, Edinburgh, and EDWARD JOSEPH LOWDON, electrical contractor, Glasgow, concurred.

COUNCILLOR LEITH, who followed, said he was present at a meeting of the Public Health Committee, when offers for the electric lighting installation for the City Hospital were considered,

and he heard a statement by Mr. Bell which conveyed the impression to his mind that Aberdeen contractors had formed a "ring." As far as he was aware, Mr. Bell's duties had nothing to do with contracting work.

EX-LORD PROVOST WILSON said that in connection with the City Hospital contract, he took the matter up with Mr. Bell point by point in order to test his estimate of £300, and see if it could be justified. They had not gone two-thirds over the specification before he had raised the price to over £400. He expressed annoyance.

Did you think Mr. Bell was qualified to express a view on the costing of this work?—No, after the estimate he had given. Witness did not know that contractors in the south had been written to and asked not to compete with the Aberdeen contractors. Mr. Bell was not expected to do contracting work.

MR. WM. TODD, a member of the Public Health Committee in 1909, said the Committee generally thought that Mr. Bell was entirely wrong regarding the City Hospital estimate.

ALEX. BRUCE ROBERTSON, electrical engineer, Aberdeen, thought it was very unfair of Mr. Bell to say that the contractors had formed a "ring" to keep up prices. It was quite untrue. He would describe Broomhill House as a costly house to wire. It was a rambling house with long, uneven runs, and he considered his price of 23s. per point for the work was not excessive. Mr. Bell said to him that the contractors were charging far too much for wiring which was done in Edinburgh at 12s. 6d. per point. Witness replied that it might be done in Edinburgh, but it was not done in Glasgow, and it certainly could not be done in Aberdeen according to the existing rules. Witness called on Mr. Milne, who advised that the matter should be considered by the Association. At the meeting the members thought that the statements in question reflected on their honesty, and Mr. Milne was instructed to send a letter to the town clerk. Witness saw a draft of the letter, and it carried out the meeting's instructions. They wished the Town Council to discuss the matter.

By MR. LIPPE: They had not sent out circulars to contractors asking them not to tender, except in the case of the City Hospital. The object was to prevent the Town Council getting free tenders for the work.

If the work at Broomhill House could be done for 8s. 2½d., don't you think that anyone is justified in saying that 25s. 9d. is excessive?—Yes, but I say it is impossible to do it for 8s. 2½d.

ARCHIBALD GILLESPIE, electrical engineer, Aberdeen, said he commenced business about 14 months ago, and his idea in taking the Broomhill contract was to gain a business connection.

Cross-examined: He lost about £4 on the job. He would never take on a contract like Broomhill House again at the same figure. Another £10 on his price would have wiped out the loss and given a reasonable profit. That would have worked out at about 12s. 6d. per point.

By his LORDSHIP: He was not a member of the Contractors' Association. He had applied for membership, however, because otherwise he could not get men to do work for him.

JAMES P. DAWSON, electrical engineer, Aberdeen, said he did not think that costing fell within Mr. Bell's professional duty. There was no intention of reflecting, in the letter to the town clerk, upon Mr. Bell's professional position.

FRANK PARKER, electrical engineer, manager to Claud Hamilton, Aberdeen, and WALTER SIMPSON, electrical engineer, Aberdeen, concurred.

Defender stated that he had been secretary of the Association since 1907, and never received any pay for the work. In his opinion the letter complained of, carried out the instructions which the meeting gave. The course followed in previous cases was to lay the facts before the Council, and no exception was taken to that. The Trades Disputes Act was never referred to, and it did not actuate witness or any of the members.

All your minute authorised you to do was to make a complaint and ask for protection?—Yes.

They resolved not to withdraw the letter, but to defend any action and indemnify you against damages and expenses?—Yes.

This closed the evidence, and MR. COOPER asked for a verdict in favour of Mr. Bell on both issues. He said because a Trade Union could not be sued for damages for libel, the only thing to do was to bring an action against the individual who had to do with the issuing of the libel. After analysing the evidence, counsel pointed out that it was perfectly legitimate for people to ask whatever they could get for their work, but it was perfectly right for a person to say "You are charging a great deal more than what is ordinarily charged for that sort of work." That was all Mr. Bell said, and all that it was complained of him as having said. Mr. Bell was an official who was blocking all those contractors who were putting enormous profits upon innocent laymen, and who clubbed themselves together in order that they might get Mr. Bell into evil odour with his employers.

The DEAN OF FACULTY, who followed, pointed out that the action was a personal one by Mr. Bell against Mr. Milne, and that they were not trying the Electrical Contractors' Association. Dealing with the evidence, the Dean said the attempt to make out that 22s., or anything like that, was extortionate, was quite out of the question. Where, he asked, was the malice on Mr. Milne's part? He was no more than a scribe. It was bad enough to say that the Trade Union were not liable, but to say that the law agent was to be liable would be carrying the thing a great deal too far and utterly beyond the law.

LORD HUNTER refused to direct that the occasion was privileged. Addressing the jury, he said a man was just as much a slanderer if he repeated a statement that had been told him as if he had invented the statement for himself. The whole case turned on their interpretation of the letter. That was absolutely everything Mr. Bell was quite entitled to express his opinion on prices even on the assumption that it did not come within his ordinary duties. It was not even suggested that in giving his opinion, whether it was right or wrong, Mr. Bell was actuated by any improper motive.

The two issues the jury had to consider were (1) whether the statements in the letter falsely and calumniously imputed to the pursuer ignorance, incompetence, and want of skill in regard to his professional duties; and (2) whether the statements in the letter falsely and calumniously represented that the pursuer was guilty of slanderously charging the Aberdeen electrical contractors with dishonesty; and that he had made similar very grave and slanderous charges on a previous occasion against Aberdeen electrical contractors.

The jury, after an absence of nearly an hour, returned a unanimous verdict for pursuer on both counts, awarding £250 damages with expenses.

THE RATING OF TRAMWAYS.

ON Thursday, June 26th, the House of Lords concluded the arguments in the appeal by the Tottenham Urban District Council against an order of the Court of Appeal in favour of the respondents, the Metropolitan Electric Tramways, Ltd. In 1910 the present appellants rated the company in respect of that portion of the company's undertaking which passed through their district, and which was originally constructed as a horse tramway, but had since been electrified, at £495 12s. 6d., and demanded payment for the first time of the full assessment. The company paid £123 18s. 2d., being one-fourth of the rate demanded, and contended that they came within the partial exemption to rates given by Sec. 211 of the Public Health Act, 1875, as they were rated as the occupier of land used as a railway constructed under the powers of an Act of Parliament, namely, the Tramways Act, 1870. The Court of Appeal held this was so, and the Council appealed on the ground that a tramway originally constructed as a tramway was not a light railway within the meaning of the Public Health Act, 1875. The question for decision is one of very considerable financial importance to electric tramway companies in London, because nearly all of them were originally constructed as horse tramways, and although it was not disputed that the partial exemption applied to the extensions of such tramways which had been made under powers given by the Light Railway Acts, the increase of rates, should the appeal be allowed, must be a serious burden to such companies.

MR. RYDE, K.C., having replied for the appellants,

The LORD CHANCELLOR said the question was one of importance, and their Lordships would take time to consider their judgment.

CHARING CROSS, WEST END AND CITY ELECTRICITY SUPPLY CO., LTD., *v.* THE LONDON HYDRAULIC POWER CO.

ON June 25th, 26th and 27th Mr. Justice Scrutton in the King's Bench Division heard this case, which raised the question of the liability of the defendants for water bursts in the defendants' mains in the City of London, which damaged the plaintiffs' underground cables, connection boxes and other works.

Mr. McCall, K.C., and Mr. C. B. Marriott were for the plaintiffs, and Mr. John Sankey, K.C., and Mr. F. Gover for the defendants.

In opening the case, MR. MCCALL said the claim was for £717 4s. 1d., the amount of repairs necessitated to plaintiffs' electric mains, &c., through the escape of water from defendants' high-pressure mains in various parts of the City of London, which damaged, and in some cases destroyed, the efficiency of plaintiffs' works. A number of bursts took place on February 4th, 5th and 13th, 1912, and on August 27th of the same year. The plaintiffs supplied electricity for lighting and other purposes to various parts of London. This was done under the powers of Acts of Parliament and Provisional Orders, and by these Acts the company were entitled to construct and maintain and use mains for the purposes of conducting the power to various places, including Water Lane, Great Tower Street, Upper Thames Street, Cannon Street and St. Swithin's Lane. The defendants supplied water pressure for the purpose of working lifts in public buildings and private houses and offices, and for that purpose they had constructed and maintained and used certain mains charged with water at high pressure. On each of the dates mentioned, the water from defendants' mains escaped in large quantities with great violence, and caused serious damage to plaintiffs' underground works. This necessitated extensive repairs, the cost of which plaintiffs now sought to recover. The defendants' case was that the plaintiffs had laid their pipes at their own risk and subject to the rights of defendants to maintain and use their own mains. They did not admit the bursts, and denied negligence, and said the bursts, if any, were caused by subsidences, and that the bursts in Water Lane, St. Swithin's Lane and Upper Thames Street were caused or contributed to by plaintiffs' own works, which impaired and disturbed the defendants' mains and the ground about them. The defendants' mains, counsel proceeded, were charged with water at an enormous pressure—some 700 lb. to the square inch, and any water that escaped was certain to do very great damage. The plaintiffs' mains were laid in 1892, and were in all cases laid under the supervision and with the approval of the engineer to the defendant company. Prior to 1912, there were a considerable number of bursts, and it would be found that there were a large number of cases in which, when a burst took place which damaged plaintiffs' mains, the defendant company recognised their liability, and paid the cost of the damages. He believed this was done in some 24 cases. The first burst now sued for was on February 4th,

1912, and was a serious one, for the main snapped and caused a great deal of damage. He should submit that the liability of the defendants in such a case as this was clearly laid down in the decided cases.

MR. SANKEY said he should submit that none of the decided cases would constitute a nuisance.

His LORDSHIP said that might be, but if an occurrence like this was continually happening it might develop into a nuisance.

MR. W. THORPE, engineer to the plaintiffs, said that a number of bursts occurred between 1904 and 1912, in regard to which the defendants admitted liability and paid the damages.

MR. SANKEY said the case for the defendants was that the plaintiffs by their own works had interfered with and broken up the foundations of the defendants' mains, and had so caused the bursts complained of. They had given details of these matters.

A great deal of evidence was called on both sides, and after hearing legal arguments at great length,

His Lordship reserved his judgment.

ACTION AGAINST ABERDEEN CORPORATION.

LORD ORMIDALE, in the Court of Session, dismissed an action against the Corporation of Aberdeen, who were sued for £400, in connection with the death of a carter, who was crushed between the front of a wagon and an electric wire standard. The standard, it was said, was a dangerous obstacle and had since been removed. His Lordship held that there was no negligence on the part of the Corporation.

GLYN *v.* HOLOPHANE, LTD.

THE hearing of this action was commenced on Friday (June 27th), before Mr. Justice Bailhache and a special jury, in the King's Bench Division. The plaintiff was Major Geoffrey Carr Glyn, a director of the defendant company, who claimed damages from the company for alleged wrongful dismissal from the position he held as managing director of the company. The action was of considerable interest, because of the remarkable allegations made by the defendants in their plea of justification.

Mr. Campbell, K.C., M.P., and Mr. Schiller (instructed by Withers, Bensons, Birkett & Davies), were for the plaintiff, and Mr. Montague Shearman, K.C., and Mr. Sylvain Mayer (instructed by Herbert Reeve & Co.), were for the defendants.

MR. CAMPBELL, opening the case for the plaintiff, said the case had become serious, as the defendants had put on the record a statement that the plaintiff had misconducted himself, and that the dismissal was justifiable. That would, no doubt, be an excellent defence, if it could be proved. The plaintiff, Major Geoffrey Carr Glyn, was a man in middle life, with a creditable career behind him, both in business and in the service of his country, for he was a partner in the firm of Glyn, Mills, Currie and Co., bankers, and had served his country in the South African war. He was also an aspirant to Parliamentary honours, and a candidate for the next General Election. In 1909, while travelling in France, he made the acquaintance of Mr. Mygatt, the chairman of the board of Holophane, Ltd. That business consisted of the sale of spheres and globes for covering electric light bulbs, and used principally for diffusing the light and distributing it to the best advantage, with the smallest possible amount of waste. Mr. Mygatt had worked that business up in America for some years before he came with it to London. The London business was not very successful for the shareholders. It resulted in Mr. Mygatt getting 55,000 fully paid up shares and £20,000 in cash. The business fell away and the shareholders got nothing. Mr. Mygatt bought the whole thing back with the assets for £1,000. Afterwards Major Glyn was induced to take an interest in the Holophane, as the patent shade was called, and an arrangement was made between him and Mr. Mygatt that he should go to America and see what had been done over there, and if he thought well of it he would see whether a company could be started again in England on better lines. Major Glyn went to America; he found that a company in Ohio made the glass, another company made the reflectors, and Mr. Mygatt's company did the distributing. It was understood that if Major Glyn put himself into the business here and was successful in forming a company with the necessary capital, he should be the managing director and not be disturbed from his position for five years. A company was formed, and the first directors were Mr. Mygatt, Lieut.-Col. F. J. P. Butler, Mr. R. Woodhouse, Lord Ernest Hamilton, and the plaintiff, who was appointed to be the managing director, although unfortunately the resolution appointing him did not specify the length of time he should occupy the position. Counsel, however, would submit that the appointment was for a year certain. In December, 1910, the plaintiff's salary was fixed at £600, and in March, 1912, this was raised to £800. During the years 1910-12 the plaintiff threw himself heart and soul into the business. The business was a considerable success owing, no doubt, to the fact that Mr. Mygatt attended but few of the meetings. Mr. Mygatt, the vendor of the business to the company, remained under certain pecuniary obligations to the English company, and the shareholders became weary, insisting that he should carry out those obligations, with the result that a case was submitted to Mr. Buckmaster, K.C., who advised that the company had a good claim against Mr. Mygatt for £12,000. At that time Mr. Mygatt had not a large majority on the board. In 1912 another director, Mr. Haggard, was appointed, and the voting became even, but Mr. Mygatt, as chairman, had the casting vote. In November, 1912, Mr. Mygatt introduced another gentleman, his private secretary, named Jones, and in December Mr. Mygatt proposed a resolution that no proceedings should be taken by the company against him. This resolution fell through for want of a seconder, and all Mr. Mygatt was able to arrange was that the matter should go to arbitration, and the proceedings before that gentleman were now pending. Mr. Campbell contended that it was because of the attitude Mr. Glyn took up against him in the matter of Mr. Mygatt's obligations to the board, that Mr. Mygatt decided to crush him. It appeared that the General Electric Co., of Queen Victoria Street, applied to Holophane, Ltd., to find out if there was any reason why they should not also sell Holophane fittings. This put the plaintiff's company on inquiry, and they found that the patent, which had been in the name of a man named Blondel, had run out. The plaintiff's company at once applied to the Patent Office to register the name Holophane as a trade mark, and that was refused.

MR. JUSTICE BAILHACHE: What were the grounds on which the plaintiff was dismissed from his position.

MR. CAMPBELL explained that Major Glyn came to an arrangement with a German firm called the Rheinische Co.—a competing body—that they should cease to carry on their business of selling globes something like Holophane, and should hand over their stock and business to the plaintiff's company. This was done to the knowledge of the firm, after many meetings; on that account Mr. Glyn was made the subject of gross charges.

His LORDSHIP asked what the charges were.

MR. CAMPBELL: It was said that Major Glyn was charged with selling as Holophane some inferior article and with suppressing a number of matters from the directors. As a result, the majority of the board dismissed him. Continuing his story, Mr. Campbell said after the purchase of the competing business, the two stocks were mixed. Some of the German stock was called Dilux, under which name it had previously been sold. Mr. Mygatt, at a board meeting, said the sale of these globes as Holophane was a criminal offence. The company's solicitors were then communicated with, and Messrs. Thompson & Co., patent agents. Messrs. Thompson expressed the view that it was perfectly legal for the company to sell the German globes made from the German moulds under the trade mark of Holophane. At a future board meeting Mr. Inglis, the company's solicitor, said he was in accord with the decision of Messrs. Thompson & Co. Mr. Mygatt's own solicitor, however, told the meeting that he disagreed, and a director, Mr. Jones, said he had consulted two counsel privately, and had been told that they considered that the sale was unlawful. It was then resolved that the company should then stop selling Dilux as Holophane. At a later meeting the resolution to deprive the managing director of his office was passed by a majority.

MR. CAMPBELL then read some of the minutes of the company. The first he would read, he said, would show that Mr. Mygatt and the board approved of the purchase of the stock of Dilux. The minute was of September 27th, 1912, when Mr. Mygatt was in the chair, "The Dilux agreement." The managing director reported as to the position with regard to the Dilux agreement, and the chairman stated that he considered the proposals of agreement for the Rheinische manufacture of glass as highly satisfactory.

It was for carrying out the duties assigned to him by the board, said MR. CAMPBELL, that Mr. Glyn had been accused of criminal acts. Then came the minute in which the company apparently deprecated the sale of the Dilux ware by the managing director. The resolution was proposed by Mr. Mygatt, the man who had known about the whole thing. It ran: "The chairman also moved that the meeting records its sense of the lack of confidence in the managing director." Col. Butler and Mr. Woodhouse took strong exception to this being placed on record, and expressed their opinion that the managing director had devoted his time and ability to the company's business, and referred to the satisfactory results which had accrued from his work. Lord Ernest Hamilton expressed his opinion that the facts and figures placed before the board were not reliable, and the statement presented to the board had been previously edited, and also that he did not believe the company had made any profit. He would, therefore, support the chairman in the lack of confidence. Mr. Lawrence Jones stated that he had only been connected with the company for a short time, and was not a business man, but he held the view that there was a lack of confidence in the managing director, and he voted for the resolution. Then came the resolution in which the managing director was dismissed. Since then Major Glyn had had nothing to do with the company, except as an ordinary director.

MAJOR GLYN, in the witness box, gave evidence in support of his counsel's opening statement. He said the turnover of the defendant company had increased from £3,000 to £34,000 during the time he held the position of managing director. Dilux consisted of shades made, he believed, on the same principles as the Holophane. There was no patent in it. The company felt the competition of the Dilux, and agreements were entered into with the German company to take over their business. He negotiated the agreements, and they were entered into with the approval of the board. Major Glyn was handed a German bowl, and said he could not distinguish it from Holophane. He said he had had the name Dilux ground off some of the German bowls and Holophane put on them. He had bought the name Dilux, and, therefore, saw no harm in doing that; in fact, he did it at the suggestion of two members of the staff, and he had consulted the company's patent agents and solicitor.

Replying to MR. SHEARMAN, who cross-examined, the plaintiff said he agreed that the accusation was not against Mr. Mygatt personally, but against the company.

How much money did you put into the company?—About three or four thousand pounds. My holding now is 31,000 shares, 9,000 of which were preference. Up to 1910, more of the kind in

question was not being sold under the name of Holophane, except by the English and American companies. The word Holophane was now on the register with regard to globes. He agreed that he had described competing ware as "imitation" Holophane.

Do you know of any cheap imitation except Dilux?—Yes, Stiblettos, but Dilux are not a cheap imitation.

Mr. Shearman: I hope to satisfy the jury that they are.

His Lordship: Why couldn't you sell it?

Mr. Shearman: Because people ordered the genuine Holophane, and I suggest that it would not be fair to perpetrate a fraud on the public and sell Dilux with the name ground off, as Holophane, when Dilux was a cheaper article.

Mr. Campbell said he would agree to that, but he would show that Dilux was not a cheaper imitation.

Plaintiff said he told the directors that he was selling Dilux as Holophane, and they knew exactly what he proposed. He held the opinion that Dilux were as good as Holophane.

Then, said Counsel, why didn't you sell them as Dilux?—Because we did not want to advertise that name. Witness agreed that the Dilux shades were heavier, and said they had received some complaints about the sale of Dilux.

Samples were then handed to the plaintiff, and he agreed that one was of heavier glass, and he thought one was slightly browner than the other. At the meeting where the charges were made he did not tell the directors that they had known all along what he had been doing, he was so surprised at the charges made. He told the board that he had informed the leading firms of the fact that what he was supplying was Dilux, and he did not think it was substantially untrue. He was aware that Mr. Inglis, the company's solicitor, had written repudiating, on behalf of the company, all responsibility for the way in which the Dilux ware had been sold. They had supplied Dilux to their own German Holophane Co., who had complained of its weight and its efficiency. His suggestion was that his appointment was for a year certain, and that he should have received six months' notice.

Mr. Shearman: Did you tell Siemens of the fact that you were supplying Dilux as Holophane?—Their order never came to me, but to the stock department, who dealt with it.

Did you ever tell Siemens that Dilux was supplied for Holophane?—No, not that I can recollect.

Were they told that the stuff they received was not the same stuff that they had received before, but was Dilux?—I don't believe they were.

You worked off the Dilux in your stock?—Yes. Plaintiff said he was sure he told English firms that he had purchased the Dilux stock.

Mr. Campbell: When you took over this Dilux stock did you have tests made, and did you believe that the Dilux were as good as the Holophane?—Yes.

Lieut.-Col. Butler, giving evidence, said he joined the company at its formation, and was a director. Complaints were received from the General Electric Co. about the competition of the makers of the Dilux shade, and the board went into the relative merits of the glass made by the American and Rheinische Companies. Mr. Mygatt spoke highly of the latter company's goods, and the result was that it was decided to do away with the competition by taking over the Dilux stock.

His Lordship: What were you going to do with that stock?

Col. Butler: As far as we could we were going to sell the spheres and hemispheres in England and the remainder abroad.

His Lordship: How were you going to sell the spheres, as Holophane, Dilux, or what?—Witness: That question does not seem to have arisen at that time. Replying to other questions, Col. Butler said he was of the opinion that Major Glyn worked extremely hard for the company, sparing neither time nor trouble.

Replying to Mr. Shearman, Col. Butler said he did not remember that Major Glyn said at any meeting that the word Dilux would be ground off the Dilux articles.

Did he ever say that the shades would be sold as Holophane?—He said they would be sold as Holophane.

Did he ever come to a board meeting and say that he had had the name Dilux ground off and that he would sell them as Holophane?—I don't know that he did.

Do you understand that the Dilux were as good as the Holophane?—I understood that they were.

You have since voted for stopping altogether the sale of Dilux shades as Holophane?—Yes.

Mr. R. Woodhouse, another director of the defendant company, said he understood that the stock of Dilux was so small that it was left to the discretion of the managing director to deal with it. When he heard at the board meeting that there was a suggestion that a criminal act had been committed in the sale of Dilux shades as Holophane, he was much perturbed and was relieved when Mr. Inglis, the company's solicitor, said it was alright.

Mr. Shearman: How much stock was there of Dilux shades?—About £1,200 worth.

Are you sure it was not more?—Yes.

Not £2,000 worth?—Oh no.

Prof. Silvanus Thompson, president of the Illuminating Engineering Society, and past-president of the Institution of Electrical Engineers, &c., was next called. He said he had made a special study of illuminating problems of all kinds for many years. He was familiar with the globe used for diffusing light, and he had known the Holophane idea for many years.

Mr. Campbell: Have you examined the Holophane and Dilux shades?—Yes, I have seen a number of examples of both.

How do they compare?—I think they are very much of a muchness. There is very little to choose between them except that the Dilux are the heavier.

With regard to their power of diffusing light, how do they compare?—I can give you the actual statistics. I experimented with hemispheres, as follows:—

Weights—10 in.;	Holophane,	7 lb. 13¼ oz.;	Dilux,	8 lb. 9¼ oz.
12 in.;	,,	13 lb. 1¼ oz.;	,,	13 lb. 8¼ oz.
16 in.;	,,	26 lb. 7¼ oz.;	,,	31 lb. 10¼ oz.
Loss of light—10 in.;	Holophane,	47½ %;	Dilux,	38·2 %
12 in.;	,,	30·5 %;	,,	29 %
16 in.;	,,	36 %;	,,	37 %

From these statistics the Court would see that the Dilux was heavier, but was the better shade from the point of view of light.

Replying to Mr. Shearman, Prof. Thompson said he was not aware what stocks the shades were taken from, nor did he know who sent them to his laboratory.

Is there more than one way of testing? asked counsel.—Yes, there are several ways.

If the National Physical Laboratory differ in their results from you, you would be inclined to think that it all depended on the samples of shades?—Yes.

Is it agreed that in the Dilux shades the prisms in the top and bottom parts are identical?—Yes, I think so.

While with regard to Holophane, the top and bottom halves are different?—I really haven't noticed, but it would not matter if they were.

Mr. W. P. Harrison, M.I.E.E., of Westminster, and vice-chairman of the Illuminating Engineering Society, said he had made a study of the illuminating question for many years, and he experimented with the shades in question at Faraday House.

Mr. Campbell: What was your conclusion as to the relative merits or demerits of these shades?—The results of my experiments showed that they were practically the same. I experimented mainly with the object of ascertaining what was the loss of light by each and found that they varied very slightly.

From the point of view of the purchasing public was there any substantial difference between the two shades?—The purchasing public would not notice the difference.

For the defence, Mr. C. C. Paterson, principal assistant in charge of the Electrotechnical Building of the National Physical Laboratory at Teddington, said he had made experiments with two different shades at the request of the defendant company. He had prepared a lot of figures, but declined to give any opinion on the relative merits of the two shades. "I am here in a semi-official capacity," he said, "and decline to express an opinion. I was asked to make experiments. I have done so, and the figures are before you."

His Lordship: Well, I can't see why you can't give an opinion, but no doubt the defendants can get an expert to work the figures out.

Mr. Shearman then addressed the jury for the defence. He said that Mr. Campbell's remark in opening his case that Mr. Mygatt had decided to get rid of the plaintiff for personal reasons was quite unfounded. The defendants' case was that Dilux—not the ware now manufactured by the German firm, but the old ware—was cheap stuff made in imitation of Holophane. He was not there to suggest that the plaintiff acted with any dishonest motive in having committed a breach of the Merchandise Marks Act; that would be a technical matter, but the suggestion was that he had taken this poor imitation of Holophane, and erasing the name Dilux, had sold it as Holophane, thus really perpetrating a fraud on the trade. The jury would hear that he did that in spite of warnings he had received from members of the company's staff. The engineering secretary had told him that if they were going to get this glass from Germany, they must send over the proper scientific moulds from which Holophane had been made. Yet the plaintiff ordered the two stocks to be mixed together and sold together, and he gave orders that some of the names on the Dilux shades should be ground off. It was absolutely *suggestio falsi* to say that he acted on the solicitor's advice. The question which he left to the jury was: Were the defendants justified in getting rid of the plaintiff as managing director, having regard to his conduct?

Prof. Charles V. Boys, F.R.S., called for the defence, said he was aware of the principle of the Holophane glass, and had known of it since the thing was invented.

You have had some figures given you which were the results of experiments at the National Physical Laboratory. What are your deductions from these figures?—They show the light being sent in various directions. It seems that a Holophane 10 in. hemisphere loses only 30·7 per cent. of the light while the Dilux loses 41 per cent. The difference between the two was between 10 and 11 per cent.

Have the Dilux any spheres?—I think they are all hemispheres.

Now to come to the glass of the Dilux shades in the possession of the defendant company as the Dilux stock, which they purchased, and the real Holophane glass; what is the difference?—The Dilux is smoky with a yellowish tint, while the Holophane is clear with a slight bluish tint.

What about the regularity of the prisms?—I found in the Dilux prisms some irregularity, while some projected more than others, showing less accurate work.

Mr. Campbell (cross-examining): Do I understand that for the purposes of your experiments you had only had one Dilux hemisphere?—The figures were worked out by the National Physical Laboratory. All the evidence I have given is on calculations I have made on the tests made at the laboratory.

Do you know whether the experiments made at the laboratory were with tops or bottoms?—I can't say.

Have you made a second test about which you have said nothing?—No. I did not make this test.

Wasn't it a fact that, in this test you are giving the result of

your calculations about, the light was half out of the hemisphere?—An electric incandescent light was put in the centre of the shade? Witness said he thought that was so.

Now, did not the other test that was made, and which you have particulars of, work out in favour of the Dilux shade?—No.

Was there not an experiment made in which the light was lowered 1⅛ in. into the shade?—Yes.

Did not that work out that the loss of light by the Dilux was 7 per cent. and the Holophane 16 per cent.?—Witness did not reply.

I suppose in any glass factory for the production of these spheres it is inevitable that there should be inequality of the work?—That is self-evident.

So that even with the best regulated Holophane shades there must sometimes be a slight inequality?—Yes.

And you would not be surprised to know that even before the Holophane people had anything to do with the Dilux they received complaints about imperfect types of spheres?—I know nothing about that. There was a remarkable uniformity about the Holophane spheres I saw. Witness went on to explain that he thought Prof. Silvanus Thompson experimented with the upper halves of Holophane spheres instead of the lower. In that case his results were wrong if the percentages were attributed to lower halves. The amount of light diffused by a lower half was different from that diffused by a top half.

MR. CAMPBELL: Do I understand that there was a difference in the lower and upper half of a Holophane sphere?—Yes.

MR. SHEARMAN: The object of the Holophane patent is to deflect all the possible light downward?—Yes.

And in the Holophane careful calculations, angles, and prisms have been put together to produce the best results?—Yes, it is the Holophane system.

Is it the proper way to test a Holophane sphere by putting the lower half where the top half should be?—The proper result of that test would be obtained when the figures were put upside down.

Supposing you put two Holophane lower parts together would that be a reasonable test?—Certainly not; that should not be done in any case.

We shall conclude our report of the case next week. On Tuesday the jury, without leaving the box, found for the plaintiff, awarding him £400 damages. His Lordship decided in plaintiff's favour on the law, and entered judgment in accordance with the jury's findings, with costs.

(*To be continued.*)

THE TELEPHONE TRANSFER.

THE matter of the National Telephone Co., Ltd., *v.* The Postmaster-General was mentioned on Tuesday in the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Kennedy and Swinfen Eady, upon the terms of the settlement which had been arrived at for the determination of the differences which had arisen between the company and the Postmaster-General as to the terms on which the business and undertaking of the National Telephone Co. should be taken over by the State.

When the case was called on, the ATTORNEY-GENERAL stated that their Lordships would not be troubled further with the matter, as the parties had agreed on terms which had been put into writing. He thought that all it was necessary to tell their Lordships was that the appeal and cross appeal would stand dismissed on the terms agreed between the parties, and which had been handed to the Registrar.

Their Lordships assented to this arrangement.

NATIONAL TELEPHONE CO., LTD.

A SUMMONS taken out in the voluntary winding up of this company raising a question of rent was before Mr. Justice Neville on Tuesday, July 1st, when Mr. Buckmaster, K.C., asked for an adjournment. Matters, he said, had arisen which he desired to put before his clients, and he desired that the summons should stand over for a week. Counsel on the other side consented.

His Lordship accordingly adjourned the summons until Tuesday next.

JOHNSON-BILLINGTON ELECTRICITY METERS, LTD.

THE petition by Mr. H. Johnson for the winding up of this company was again before Mr. Justice Neville in the Company Court on Tuesday, July 1st, and was, with the consent of all parties, adjourned for another week.

BRITISH INSULATED AND HELSBY CABLES, LTD., *v.* LONDON ELECTRIC WIRE CO. AND SMITHS, LTD.

AN action was concluded at the Lancashire Chancery Court, sitting at Liverpool on Friday, before Vice-Chancellor Stewart Smith, in which plaintiffs claimed damages against defendants, of Anaconda Works, Salford, for an alleged infringement of their registered designs for overhead trolley wires for electric tramways, and asked for an injunction to restrain the defendants from further infringements of their copyright.

Plaintiffs' case was that in 1908 they registered two designs for a trolley wire showing a groove on two sides, dividing it into two sections, and described as non-fouling, and that in 1909 the defendants sold, or offered for sale, to the Corporation of Halifax and Wallasey such wire, which, it was contended, had been made in accordance with, or was an obvious or fraudulent imitation of, the said designs.

The defence put forward was that the designs adopted by the plaintiffs were not new or original designs. The defendants denied that the plaintiffs had any copyright in the said designs, or that they had infringed or threatened to infringe such copyright.

One of the representatives of the plaintiff company stated that 35 corporations in this country had been supplied with plaintiffs' wires, and that they had also supplied South Africa and Australia in large quantities.

MR. W. M. MORDEY, electrical engineer, said he was responsible for the direction of many systems of electric tramways. In his opinion the wires supplied by the defendant company were an infringement of the plaintiffs' designs. He further stated that the wires of the plaintiff company surmounted in the fullest degree the difficulties previously experienced in relation to the attachment of the trolley wires to their overhead support.

His HONOUR reserved judgment.

OSRAM LAMP WORKS, LTD., *v.* DAVID SMITH & CO.

IN the Chancery Division on Tuesday, July 1st, Mr. Justice Warrington had before him this case as a short cause on a motion for judgment. The action was for an injunction to restrain defendants from infringing plaintiffs' letters patent.

MR. HUNTER GRAY, for plaintiffs, said it was a motion for judgment in default of defence.

His LORDSHIP made the usual order.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Instruction Board for Motor Users.

In order to prevent any hindrance to the rapid adoption of electricity for motive power, it is most important that every possible precaution should be taken to ensure that the motors and starters are properly handled, more especially as the great majority of them are in the hands of unskilled operators. With this end in view, the PHŒNIX DYNAMO MANUFACTURING CO., LTD., have got out a new instruction board for use in connection with their installations in textile mills. The principle adopted to prevent mistakes in starting is based upon the view that every decent Englishman is familiar with the order "red, white and blue." The switches are coloured correspondingly. As the instruction board appears likely to interest a good many of our readers, containing as it does the essential instructions dictated by experience in the briefest form, we reproduce it herewith.

PHŒNIX DYNAMO MANUFACTURING CO. LTD.,

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Important to Users of this Installation.

1. Only authorised persons allowed in this room.
2. See that the handles of all Starters are at the "off" position (RED) before putting current on at Main Switch (RED).
3. To start up a motor push starting handle over to starting position (WHITE).
4. When motor is up to speed as shown by meter on starter swing starting handle smartly right over to running position (BLUE). Never leave it on WHITE position.

REMEMBER THE ORDER:

RED WHITE AND BLUE

Notes for Electrician.

1. Keep a spare fuse for each size properly fitted with fuse ready to facilitate instant replacement.
2. In case of a motor fuse blowing be careful to see that its Starting Switch is in the "off" position (RED) before replacing fuse.
3. In case of the Main Switch (RED) tripping through any cause, place all Starting Switches to "off" position (RED) before making Main Switch (RED) alive again, otherwise fuses will be blown and delay possibly occur.
4. Examine all oil switches weekly to ensure level of oil being correct. Use only oil provided by the makers.
5. Dust or blow out the motors at least once every 14 days.
6. The bearings are in dust type covers; fill the Stauffers in a perfectly clean place with grease as supplied with the machines and fill the Stauffer lubricating cup once every 4 weeks.
7. If you are in doubt about any point, ring us up or come to see us. It is our business to help you.

FIG. 1.—PHŒNIX MOTOR INSTRUCTION BOARD.

Electric Lighting Set.

The accompanying illustration shows the latest type of Messrs. John I. Thornycroft & Co.'s petrol or paraffin-electric lighting sets combined on one bedplate. These sets are admirably adapted for ship or private house lighting, being very compact and extremely simple to operate.

The motor is a Thornycroft M/2 16-b.h.p. petrol type similar to the marine type. The motor is specially constructed to run on either petrol or paraffin ; ignition is by a Bosch high-tension magneto. The

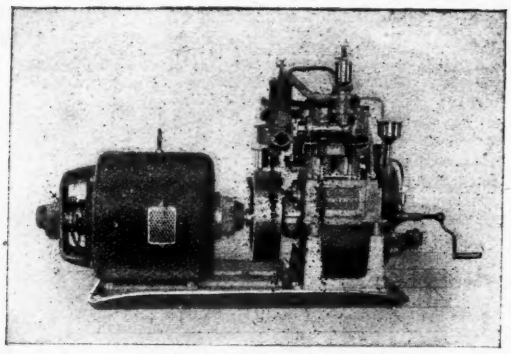


Fig. 2.—Thornycroft Petrol-Electric Set.

engine is controlled by a very sensitive enclosed centrifugal governor, by means of which the speed can be kept practically constant, no matter how much the load may vary. The generator is of the usual four-pole type, with an output of about 7 kw. when running on paraffin and 9 kw. on petrol. These sets are exceptionally well finished, and, before leaving the works, are subjected to a very severe series of tests, thus ensuring highest efficiency.

H.M.A.S. "Australia."

As our readers are probably aware, H.M.A.S. *Australia* is the battle cruiser which will be the flagship of the first unit of the Australasian squadron ; she is to be manned largely by Australian born seamen and by seamen who have sailed in Australian waters ; and the cost of her building and equipment has been borne by the Commonwealth Government. On Monday last, the King inspected her privately at Portsmouth and honoured the Australian Navy by knighting its first Commander-in-Chief, Rear-Admiral G. E. Patey, on the quarter deck. An item of interest to our readers in connection with this vessel is the fact that she carries a ring main

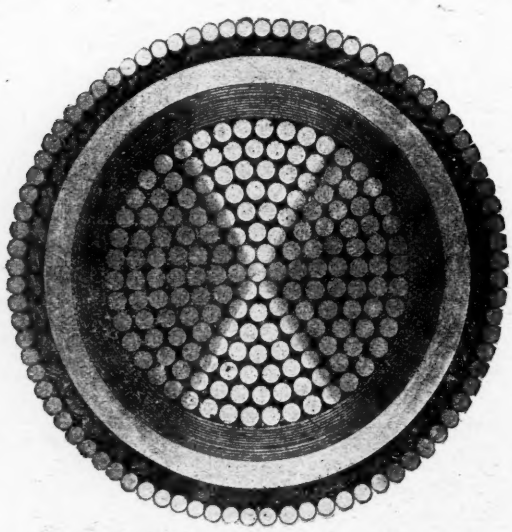


Fig. 3.—Heavy Ring-Main Cable by Henley's.

cable which is, we believe, the largest that has ever been installed on any ship. We show a full-sized illustration of this cable, and it will be observed that its diameter is nearly 3 in. Its sectional area is 2 sq. in. and its weight per thousand yards 23¼ tons, the specification being as follows :—

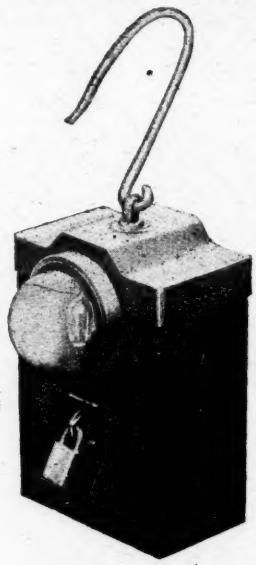
169 h.c. tinned copper wires each '124 in diameter insulated with long fibre paper sheathed with a solid drawn tube of lead served with tarred jute yarn and armoured with galvanised steel wires, left bright.

H.M.A.S. *Australia* was built by Messrs. John Brown & Co., Ltd., of Clydebank, and the cable referred to above, as well as the whole of the cable used in the vessel, was supplied by Messrs. W. T. Henley's Telegraph Works Co., Ltd.

The Edison Miners' Electric Safety Lamp.

The latest Edison production is an electric safety lamp for miners' use, in respect of which Mr. T. A. Edison has recently been presented with the Rathenau medal by the American Museum of Safety, for the best electrical device designed to reduce the element of fatal risk to persons employed in what are considered dangerous and difficult occupations.

The lamp is made in two forms, one being of the usual self-contained and portable type—illustrated herewith—and the other having the lamp separate from the battery. In the latter case the lamp is arranged to be mounted in front of the miner's cap, and the



From *Edison Monthly.*

Fig. 4.—Edison Safety Lamp.

battery is carried from a belt on his back, his hands and arms being thus entirely free. The feature of the design consists in connecting the positive terminal of one cell to its container, and the negative terminal of the second cell to its case, the two containers being also electrically connected. It is thus possible to enclose the two cells in a steel box without the introduction of any insulation walls. The battery is securely locked, and the lens is not only of the proper optical conformation, but of the requisite mechanical strength. In the lamp arranged for use on the miner's cap, once the connecting flexible is pushed into the sockets of the battery and of the lamp, it is impossible for the miner to disconnect them, and so cause a possible spark in the mine.

PARLIAMENTARY.

Western Valleys (Monmouthshire) Railless Electric Traction.

After a four days' hearing the Select Committee of the House of Commons, presided over by Mr. Clancey, has found the preamble of the above Bill passed. The proposal is to incorporate a company with a capital of £135,000 to work trolley vehicles from Brynmawr to Newport.

Mr. Vesey Knox, who appeared for the promoters, explained that it was proposed to construct about 8 miles of trolley line through a narrow valley, which contained a mining population of 60,000, and where the railway communication was very bad. It would start at Brynmawr, which was 1,200 ft. above the sea level, and pass through Nantyglo and Blaina, Blaenau Gwent, Abertillery, Six Bells and Aberbeeg to Llanhilleth, which was 500 ft. above sea level. The Urban Councils of Abertillery and Nantyglo, and the County Councils of Breconshire and Monmouthshire were opposing for the purpose, counsel suggested, of getting as much out of the promoters as they could towards the maintenance and improvement of the road. It was also suggested that there was no assurance that the promoters would find the necessary money, but the directors were Sir James de Houghton, Sir Alex. Gibbons, Col. Harris and Mr Parry, the last two of whom were well known in the district. If a contribution of as much as ⅜d. per car-mile run was imposed on the company it would kill the scheme.

A number of witnesses having been called with regard to the existing lack of travelling facilities in the district, the Chairman intimated that the Committee were satisfied regarding the necessity for the undertaking, but required evidence on the question of contribution and of the damage likely to be done to the roads.

Mr. J. B. Hamilton, manager of the Leeds Tramways, expressed the opinion that the width of the road was sufficient to ensure the

safety of the public, and did not think a widening or a reconstruction of the present surface was necessary.

SIR ALEX. GIBBONS, Bt., one of the promoters, said he saw no reason why the capital of the undertaking should not be raised without difficulty. The promoters found it difficult to ascertain what they would have to pay for electric current, and hence it was difficult to say what contribution towards the maintenance of the roads would prove too burdensome. He was advised, however, that ½d. per car-mile would be quite sufficient to kill the scheme.

In answer to the CHAIRMAN, MR. VESEY KNOX said that any purchase clause on the basis of allowing each local authority to buy small bits of the line within its own area, would absolutely bring the scheme to an end. If any purchase clause was put upon the promoters it should be the ordinary light railway clause, *i.e.*, that the whole, and not a portion or portions, of the line should be purchased.

Answering further questions by the Committee, COUNSEL said the professional advisers thought the scheme would carry ½d. per car-mile as road contribution if that condition was not made to apply to cars run under the clause dealing with workmen's cheap fares morning and evening.

MR. TALBOT, K.C., for the Breconshire County Council, contended that it was essential that the Council should maintain the principle that persons who came for Parliamentary powers over public roads should not be allowed to use the roads for their own profit at the public expense.

Evidence was given by MR. MAYBURY, county surveyor of Kent, that the roads were unsuitable for the proposed traffic, and similar evidence was given by MR. W. L. HARPER, county surveyor, and MR. W. J. DAVIES, surveyor to the Nantyglo and Blaina U.D.C.

The Committee decided to pass the preamble of the Bill, subject to several conditions. With regard to purchase, they considered the company should have a tenure of 25 years, and that the purchase price after that period should be fixed under the terms of the Light Railways Act. The work should be commenced within 18 months of the passing of the Bill, and completed within the following year. The new company should be allowed to erect its own generating station. As to contribution for maintenance of roads, this should be at the rate of ½d. per car-mile, excluding cheap workmen's cars. The company should pay one-third of the cost of reconstruction of roads in the urban districts, but the sum should not exceed £500.

Hove Corporation Bill.

A SELECT Committee of the House of Commons, under the chairmanship of Mr. Gardner, considered the Hove Corporation Bill on June 25th and 26th, the principal proposal in which deals with the transfer of the undertaking of the Hove Electric Light Co. to the Corporation. Mr. C. J. Talbot, K.C., and Mr. Keen represented the promoters, and Mr. Rhodes represented the Local Government Board. There was no opposition to the electric lighting proposals.

MR. TALBOT explained that the local authority obtained a Provisional Order in 1890, and transferred it to the company in 1892, with the proviso that the Corporation should have power to acquire the undertaking after 21 years, or after that period had elapsed they could purchase at the end of every succeeding seven years on giving 12 months' notice. Under this agreement the Corporation had given the necessary notice. In 1898 the local authority obtained a Provisional Order for Aldrington, and had worked it themselves, taking the current in bulk from Brighton. If the Hove Corporation took over the Hove Co.'s undertaking the agreement with Brighton would be terminated. The Hove Co. had had a successful career, and placed a considerable amount to reserve, but their charges had remained higher than either Aldrington or Brighton. The basis of the agreement for purchase consisted first of paying the amount of the company's legitimate capital expenditure, and then making up their receipts available for distribution as dividend to a total amount of 7 per cent. cumulative. Practically during the whole of its existence the company had had 7 per cent. available for dividend. The amount was not agreed, but an approximate figure could be given, and if the parties did not come to terms about it, the matter would go to arbitration.

MR. RHODES said the company was getting a very good *quid pro quo*.

MR. TALBOT said the Corporation wanted to consolidate the whole thing into one Bill, and to show the Committee it was a reasonable thing in the interests of the town. They wished to reserve power either to work the undertaking themselves or to hand it over to the company to do so. The question before the Committee was that the Corporation asked for a longer period for the repayment of the necessary loans than the Local Government Board were prepared to give.

ALD. MARKS, the Mayor of Hove, said the company's capital expenditure up to the end of 1912 was £176,298. The company's share capital was £100,000, and the debentures £44,000, and the balance was made up of the sinking and reserve fund. Last year, after paying directors' fees, which amounted to 1 per cent. on the capital of the company, they made a profit of £14,630, out of which they put 1½ per cent. into a renewals fund, 3 per cent. into the sinking fund, and they could still pay 9 per cent. on the shares. If the Corporation were granted 30 years for repayment, the actual repayment for principal and interest would be £10,937. This would leave a balance of £3,692, and if they reduced the price of electricity by ½d. per unit, a sum of £2,375 would be absorbed, and a balance of £1,317 left.

Replying to MR. RHODES, Witness said that if only 21 years were allowed for repayment there would be no balance and no opportunity for reducing the cost of the light. It was true they were paying the entire capital expenditure without allowance for depreciation, but, on the other hand, they were paying nothing for the goodwill of a concern making £14,000 a year profit.

MR. DYKES, of Messrs. Handcock & Dykes, electrical advisers to the Corporation, gave evidence to the effect that in his opinion the plant was exceptionally good. In the mains there were about 150 tons of copper, the value of which had gone up very considerably.

MR. RHODES contended that the Corporation ought only to be allowed 21 years for the repayment of the loans, but

The Committee decided to grant a period of 30 years for the purchase loan, and 20 years for loans for extensions. The Committee also allowed the clause providing for Aldrington and Hove coming under the one set of provisions in the Bill.

Bradford Corporation Bill.—The Bradford Corporation Bill has passed Mr. Middlebrook's Select Committee of the House of Commons, the only opposition being to the improvement scheme. The Bill authorises the Corporation to spend £11,220 on trolley vehicles.

Various Bills.—In the House of Commons, on June 25th, the Richmond (Surrey) Electricity Supply Bill was read a second time. In the House of Lords, on Monday, the Kent Electric Power Bill was read a third time. In the House of Lords on July 1st, the Chesterfield Corporation Railless Traction Bill passed third reading. In the House of Commons on June 26th, the Mexborough and Swinton Tramways (Railless Traction) Bill passed third reading.

Post Office (London) Railway Bill.—In the House of Commons, on June 25th, the financial resolution in connection with this £1,100,000 scheme was passed.

ELECTRICAL ACCIDENTS IN 1912.

THE Report for 1912 of H.M. Electrical Inspector of Factories and Workshops, Mr. G. Scott Ram, was issued last week and is given in abstract below :—

TABLE I.—ACCIDENTS AT ELECTRICAL GENERATING STATIONS AND SUB-STATIONS IN 1912.

The small figures relate to fatal accidents, and are included in the principal figures.

Description.	Public supply stations and elec. railways and tramways.	Other stations.
Non-electrical :—		
At engines, pumps and generators ...	28^2	6
At boilers and steam plant	63	2
At coal handling plant	19	2
Falls	85^7	11
Struck by falling bodies...	29	2
Miscellaneous	110^2	14
Total	334^{11}	37
Electrical :—		
At switchboards when engaged in ordinary routine work	11	2
Cleaning, repairing, &c., at "live" switchboards or other "live" conductors	27^3	6
Cleaning, repairing, or other handling of switchboards supposed to have been made "dead"	7	—
Adjusting brushes and cleaning commutators, and flashing at commutators	6	5
Miscellaneous	7^1	3
Total	58^4	16

The number of mechanical or non-electrical accidents is greater by 25 per cent. than last year. These accidents are very similar to those that occur in other engineering works, and call for no special comment here. The number of electrical accidents is identical with last year and the number of fatalities (four) is the same.

Ten of the accidents in the first class were due to mistakes on the part of the switchman, producing heavy arcing at the switch, with consequent burns to the hand and arm, and in one case to the face. Mistakes in switching are bound to occur occasionally, but the number of accidents from this cause is remarkably few. The injuries consequent on such mistakes would in many cases be less severe or entirely prevented if the switch handles were provided with suitable guard disks.

The next class of accidents—cleaning, repairing, &c., at switchboards—is as usual the largest, and one of the most instructive as showing the risks which are taken often unnecessarily by station engineers and attendants familiar with the dangers. The three fatal cases occurred on extra-high-tension three-phase switchboards. The first occurred to a contractor's engineer engaged in making extensions to the switchboard, who was familiar with all the details. He had not started work for the day, having only just come in, and was engaged discussing the work with the station engineer, who had previously warned him and others who were present that the whole board was live. Either in a moment of forgetfulness, or thinking despite the warning that a certain switch was dead, he touched a live terminal with fatal results. The next

case was one of cleaning dead parts of the gear, whilst adjoining conductors were live. A prosecution for breach of the regulations was instituted in this case, and the occupiers were fined £25 under Sec. 136. Notice of appeal, however, has been given. The third fatality occurred to a competent engineer when acting under the supervision of his superior officer. A compartment of the switchboard normally closed up by slate slabs held in position by bolts, and not designed or intended for use as a switchboard passage-way, was opened up by the removal of one of the slate slabs for the purpose of tracing out certain connections. One man entered through this opening, having then to crawl under various obstructions in order to see the connections at the back of the most distant panel, and the second man, who was in charge, started to follow him. The man in front touched a live conductor and was killed. How it occurred that two trained men, who apparently knew of the dangers, came to run such a risk on a matter which was apparently of no urgency is inexplicable. The investigation might have been made at the week-end, when the board could have been made entirely dead.

Of the non-fatal high-tension accidents, four occurred to men working close to apparatus which they knew to be live, apparently quite regardless of the risks which they were taking. Most of the accidents under this heading were through short circuits when working on direct-current medium-pressure switchboards for traction or general three-wire supply. A number were caused by the use of ordinary metal tools, *e.g.*, spanners, files, pliers, hack-saws, steel rules, when working at the backs of switchboards. Other short circuits were made whilst cleaning the switchboards. In one case a metal-bound brush was being used and caused the short circuit. Six accidents were due to short circuit in changing the connections of measuring instruments, either through the medium of metal tools or by the wires touching the frame direct. In many of the above accidents the injuries were very severe. In one case, following on the changing of the connections of a wattmeter, a disastrous fire occurred, completely destroying the switchboard at which the accident happened and another switchboard at a distance. Other accidents occurred when making tests at the switchboards.

Under the next heading—working on switchboards supposed to be dead—six were on high-tension switchboards. Two causing injuries to three men were due to switchgear being live through being fed back from a distant sub-station. Three occurred to men in cleaning switchgear, having omitted to make it dead by switching-off at the isolating switches. Another was due to carelessness on the part of the engineer in charge of a sub-station in not taking proper precautions to see that a man, whom he knew to be engaged on work at high-pressure isolating switches, was clear before he switched on at another part of the station. The accident would have been avoided if the two switches on the incoming mains had been locked off and the key held by the man working on the high-tension conductors.

In the next class, the accidents were due to flashing-over at commutators or slip rings when cleaning the same or when adjusting brushes.

Under the heading "Miscellaneous," the fatal accident was due to a man walking in the dark into a cable which was under test in the yard of a sub-station. The premises were in the hands of contractors at the time.

TABLE II.—Electrical Accidents in Factories other than Electrical Stations in 1912.

The small figures relate to fatal accidents and are included in the principal figures.

Arcing of switches	...	23
Arcing of fuses	...	8
Shock or burns from fuses when replacing fuse wires	...	27
Portable apparatus, connectors and flexible wires	...	61
Unprotected conductors, switches, terminals, fuses, &c.	...	27 [1]
Working on or near live conductors — Skilled persons	...	32
Working on or near live conductors — Unskilled persons	...	33 [5*]
Miscellaneous accidents in electrical manufacturing and repair works—mostly in testing operations	...	32
Adjusting brushes and cleaning commutators, and flashing at commutators	...	9
Miscellaneous	...	31 [9]
Total	...	283 [15]

* One fatality due to fall following shock.

These accidents are slightly less in number than last year—283 as against 290—but the fatal cases are 15 as against only seven.

Of the accidents due to arcing of switches, 10 were due to flashes caused by switching on motors with the starting resistance cut out, mostly owing to defective automatic release action on the starters. Others were due to faulty D.P. switches or starting switches. The accidents from the arcing of fuses were due to the absence of proper protection of the fuse-wires.

The accidents in renewing fuses were mostly due to the replacing of fuse wires in live contacts, either directly or when held in unsuitable carriers. Except for one case of shock, the main injuries were all burns from short circuit. In some cases the terminals were short-circuited by the spanner or screwdriver which was being used. In others the short circuits were made by the fuse wires getting across the terminals. In several cases switches were provided by which the terminals could have been made dead, but they were not used. In three cases switches were provided in the same box as the fuses and without any insulating or other division, and short circuits were made across the switch blades or switch contacts. In a few cases the arcing was due to replacing the fuses on a short circuit, the fault which caused the fuse to blow in the first instance not having been remedied.

(To be continued.)

REVIEWS.

The Design and Construction of Steam Turbines. By Harold Medway Martin. London: Longmans, Green & Co. Price 25s. net.

Mr. Martin's substantial volume cannot fail to appeal particularly to those central-station engineers and others who are responsible for the satisfactory running of steam turbines. Many readers of the volume will be already familiar with much of the contents of this work regarding the theory of the steam turbine, as this section is based upon a series of articles contributed to the columns of our contemporary *Engineering*. In the first chapter Mr. Martin gives us a few "preliminary ideas" about turbines in general; then after having shown that a guide blade or nozzle forms an essential element of every turbine, he discusses the design of these elements, showing, in this connection, the uses of the total heat-entropy, or Mollier diagram. More theory follows, impulse buckets, the efficiency ratio and reheat factor and correction curves forming interesting and well-reasoned chapters which, like much of the book, are necessarily mathematical. Here we might say that the errata in the formulæ are distinctly numerous, though most of these appear to have been detected after the book had gone to press, and are indicated at the commencement of the volume. Doubtless this blemish will be removed in the case of later editions.

After working out fairly completely the theory of the steam turbine, Mr. Martin proceeds, about half-way through his book, to discuss the constructional details of various types of machines, and gives descriptions of representative turbines including the Parsons, De Laval, A.E.G., Rateau, Zoelly, and several others of the Parsons type. The volume is splendidly illustrated, and should take a permanent place in the library of any engineer who in any way is interested in the working of the steam turbine.—G. S. S.

A Laboratory Manual of Alternating Currents. By Prof. J. H. Morecroft. London: Longmans, Green & Co. Price 7s. 6d. net.

Prof. Morecroft has given us an interesting and useful book, which will be found to contain many ideas and suggestions of value to the somewhat limited class of readers for whom it has been specially written. The book is a laboratory manual adapted for use in connection with the advanced classes in universities and colleges, and is neither intended nor suited as a guide for the work of a commercial laboratory or test house, although there are many things in it which might well prove useful and suggestive to the experimenter who has left his college days behind.

The tone, as well as the arrangement, of the book is academic, in the best sense of that term. The object of the experimental work described in it is educational, and the measurements are not primarily directed towards securing results of immediate practical or commercial value.

In his introduction, the author explains why he does not give detailed instructions for carrying out the experiments which form the suggested course, and why he prefers to leave the student to devise his own diagrams of connections and methods of observation. Seeing that his book is intended for the use of advanced students, he is probably right in his decision on this point. He further explains that the mathematical theory is given in the case of such problems only as are to be approached experimentally, the general theory of alternating currents and alternating-current machinery being left to form the subject of the lecture courses attended by the students. While here, again, this appears to be the wisest course, the result is sometimes a little unbalanced, inasmuch as a long and full theoretical discussion on certain parts of alternating-current theory is presented, while other, and equally important, parts of the subject, which do not happen to be so easily capable of experimental illustration, are for that reason not touched upon. Further, some chapters of the book consist mainly of a somewhat lengthy theoretical investigation involving many detailed considerations, followed by a relatively simple and obvious experiment, illustrating only the more

elementary parts of the theory. This apparent want of balance was perhaps unavoidable, and is not brought forward as a defect, but rather as indicating that the book is essentially for use as a companion to the more general text-books, and that it is not intended to displace them.

Proceeding to a more detailed survey of the contents, we find that, as a rule, each experiment forms the subject of a single chapter. The treatment usually consists in a fairly complete, and sometimes a very detailed, mathematical theory of the subject to be illustrated, followed by a short general description of the test to be carried out by the student, and by some questions to be answered from the results of his observations.

We begin with a couple of experiments dealing with wave-forms and their influence on the indications of instruments —an important matter which is apt to receive too little attention. Then follow eight experiments dealing with alternating-current circuits containing resistance, inductance and capacity.

The symbolic system of notation is introduced in connection with these experiments, although little further use is made of it in the later portions of the book, and general differential equations are given. Surely the author is hardly correct in stating (page 28) that Z (representing impedance) has direction and is a vector. If Z is a vector, the product $IZ = E$ must be the product of two vectors, and should contain both scalar and vector parts.

Experiments on alternators follow next, and in connection with them a very full treatment is given of a method for predetermining the external characteristic of an alternator under load. As, however, the method depends on sending full-load current through the stationary armature from an external source, in order to determine the true armature impedance, it can hardly be regarded as a practical method for use on a commercial scale.

There follows a number of experiments on transformers, including determinations of the losses and efficiency and heat runs, also a suggestive experiment on the parallel operation of two transformers.

Next come some experiments dealing with measurements on polyphase circuits, including one dealing with the higher harmonics of a three-phase circuit.

Experiments on the synchronous motor and rotary converter, with a special study of the action of interpoles, are followed by others on the induction motor, induction generator, single-phase series motor, and the mercury vapour arc rectifier. The treatment of the induction motor and series motor is not quite as full as might have been expected, and is, perhaps, the least illuminating part of the book.

An appendix gives 27 plates of oscillograms of current, voltage and other waves, all of a very interesting and instructive character; one or two of the curves are, unfortunately, rather indistinct in the reproduction.

The book is excellently produced, and both type and diagrams are admirably clear. One is a little inclined to regret the absence of an index, although a full list of the 39 experiments at the beginning goes some way towards rectifying this omission; the fact that the work is not intended for general reference may be pleaded as a further excuse.

The book is certainly one which should be placed on the shelves of every electrical engineering college library, and which should be carefully studied by those in charge of the laboratory work.—C. F. S.

The New Steam Tables, together with their Derivation and Application. By PROF. C. A. M. SMITH, M.Sc., and A. G. WARREN, B.Sc. London: Constable & Co., Ltd. Price 4s. net.

Prof. Smith and his able assistant—both, by the way, now on the staff of the University of Hong-Kong—have given us in this volume a fine collection of tables that will be of undoubted value to British engineers and students. On the Continent there exists a similar work by Prof. Mollier, of Dresden, whose tables are, of course, in the metric system of units. Both sets of tables, however, have a common ancestry, being based on the researches of Prof. H. L. Callendar. The authors have been fortunate in obtaining an introduction to their work by Sir J. Alfred Ewing, K.C.B., F.R.S., to whom we are largely indebted for the existence of the present volume, seeing that it was he who first drew attention to the importance of the work done by Callendar and Mollier. The "Tables" are equally divided into two parts, the first being in Centigrade units and the second in Fahrenheit units. As Sir Alfred Ewing says, this latter feature "may be a prudent concession to national bad habits, but students cannot be too strongly urged to accustom themselves to the use of the Centigrade scale in all steam calculations. To adhere to Fahrenheit degrees and the quantities dependent on them is to maintain a wholly unnecessary and exceedingly inconvenient barrier, not only between applied science and the science of the physical laboratory, but also between the engineering of England and that of other countries," with all of which we are in the most entire agreement. In both sections the Tables give the properties of saturated steam on various bases, the specific heats of saturated steam at various temperatures and pressures, and lastly, the average specific heats of superheated steam from saturation to tabulated temperatures at various pressures. The authors describe clearly how values not included in the Tables may readily be calculated, and give a chart representing the total heat of steam on an entropy base, a graphical method of representing the properties of steam which is already largely used, especially in connection with steam turbine problems.—G. S. S.

BUSINESS NOTES.

Holiday Literature.—There have been issued from the Isle of Wight Publicity Office (29, John Street, Bedford Row, W.C.) a number of excellent booklets, dealing respectively with the attractions of the following holiday resorts:—Freshwater and Totland Bay; Bembridge, Sandown, Ventnor and Sea View and St. Helens. All of these are official publications, and copies can be obtained either from the respective town clerks or from the address given above.

"Eye-Rest" Lighting at Rugby.—One of the latest "Eye-Rest" installations is in the Temple Speech Room at Rugby School. The room is fairly lofty, and the fittings are suspended close to the ceiling, but the pictures on the lower part of the wall are excellently lighted, the light and shade effects, it is claimed, being equal to those of daylight. The installation consists of one 55-in. fitting containing nine 200-watt Mazda lamps in the centre of the room, one 36-in. fitting containing nine 100-watt Mazda lamps at each end, and one 24-in. fitting containing three 100-watt Mazda lamps in each of the transepts. The fittings are attached to the ceiling by means of contact suspension gear, so that they can be lowered to the floor for cleaning. The B.T.H. Co.'s illuminating engineers consider that the installation is one of the finest examples of interior illumination to be found in this country.

Consular Notes.—Norway.—The British Consul in Norway reports that the Hardanger works produced about 2,200 tons of pig-iron in 1912. The Tinfos works were delayed by late delivery of plant, and only got furnaces to work in 1912, each producing about 10 tons of good quality pig-iron per diem. The Ulefos works produced about 300 tons of electric pig-iron. Work progressed on the future Arendal undertaking. The Stavanger electro-steel works were nearly completed by the end of 1912, power being supplied from Ryfylke power station, at first about 1,500 H.P. The estimated production is about 6,000 tons of steel per annum. The raw material used will be old iron, not iron ore, chiefly broken-up vessels, melted in a Martin furnace and refined in an electric furnace. The Jossingfjord electric furnace has been at work periodically, and the Noes ironworks, which chiefly supply crucible steel by old methods, have worked much as usual.* At Sydvarangar, the largest Norwegian iron mine, extensions were completed, allowing of an estimated annual output of about 500,000 tons, of which 200,000 tons are briquettes and 300,000 tons "slich." Further extensions are contemplated to bring the production for 1913 up to 650,000 tons or 700,000 tons. The capital for this extension, about 3,000,000 kroner, is Norwegian, and brings the total ordinary share capital up to 15,000,000 kroner, of which about 5,000,000 kroner is thought to be in Norwegian hands. The power station will be extended with a steam turbine set of 4,000 KW.

Important fresh discoveries of silver have been made at the Kongsberg Government silver mines, and electric power has been supplied from the Kongsberg municipal electric works to the mines. The Sulitjelma copper output was a record, 123,250

* Owing to cost of production, electric iron-smelting at the Hardanger works and at Arendal has been given up since the above was written.

tons export pyrites, 14,850 tons best ore, and 11,500 tons Elmore concentrate. Most of the best ore and about half the concentrate was smelted, giving 1,024 tons Bessemer copper. The workings are said to be still very satisfactory. About 12 Elmore washing machines have been at work all the year, and refuse from old washings has been passed through the Elmore machines with profitable results. The Knudsen smelting process has progressed as before. The Wedge roasting furnace and Anaconda type flame furnace were completed in September, and are calculated to bring the annual smelting up to 40,000 tons to 50,000 tons, representing 2,000 to 2,500 tons Bessemer copper.

The following was the approximate production of the other principal Norwegian copper mines in 1912 :—

	Production.	*Tons.*
Birtavarra	Bessemer	282
Bossmo	Pyrites	23,500
Lökken	„	116,000
Foldal	„	72,000
Röstvangen	„	26,893
Röros	Copper	587
„	Pyrites	11,000
Killingdal	„	25,000
Stordö	„	21,100

The total estimated Norwegian production of pyrites in 1912 was about 430,000 tons, worth £530,000; of copper, 2,150 tons, value £153,000.

As regards electro-thermic products the Consul reports that the Norwegian export of calcium carbide in 1912 was about 64,208 tons, as compared with 60,593 tons in 1911. All the Norwegian manufacturers are believed to belong to the combine. Norway produces about two-thirds of the European consumption of carbide after deducting what is supplied in France. The average price per ton at Norwegian port in 1912 was about £9. The British Cyanamide Works, at Odda, which started in 1909, are stated to have exported 13,892 tons, as against 13,172 tons in 1911. The ferro-silicon exports reached 6,493 tons; zinc exports, 8,928 tons; and the aluminium exports about 1,800 tons. The total value of the exports of carbide, ferro-silicon, ferro-chrome, zinc and aluminium are calculated roughly to have reached some £1,200,000, from which some £500,000 must be deducted for raw materials purchased abroad.

The saltpetre industry prospered in 1912. Prices ruled high and demand was brisk. Practically the whole production for 1913 is thought to be sold already. The whole of the present Rjukan plant was in full working order by the end of May, and further extensions are being planned. The British Vice-Consul at Skien states that work has been begun for the reutilisation of the water power by taking the water used at Vemork Power Station through a long tunnel and down to turbines at Station No. 2 near Saaheim, thus affording two stations of 130,000 and 110,000 H.P. respectively. The product is transported by rail and lighter to Skien for shipment, but the sale is centralised at the head offices of the company at Christiania.

The British Vice-Consul at Skien reports that the town of Porsgrund, and adjoining districts, have purchased the Aarlifos waterfall, in Hiterdal, for electrical purposes. The power which will be obtained is estimated at some 10,000 H.P. The town of Skien have also contracted with a Larvik firm to rent 3,000 electrical H.P. In this connection the Vice-Consul at Larvik adds :—"The Skein municipality have lately bought from the proprietor of the Grini Farm, Laurdal, his waterfall rights in the river Laugen, for the purpose of bringing electric power to the town, but when they will commence with the project was not decided at the time of writing. Skien has also made a contract with Mr. Treschow Fritzoe for supplying power from his electric works in Slerndal. Mr. Treschow Fritzoe will also supply Sandefjord from the same works at Slerndal.

The new wireless stations on the German Telefunken system at Bergen, Ingo (near Hammerfest), and Spitzbergen, are now completed and in working order. Subject to the sanction of the Storthing, a contract has been concluded with the Marconi Co. for the erection—probably in the neighbourhood of Stavanger—of a powerful station for direct wireless communication with the United States. A coal company in Spitzbergen is also understood to possess a private wireless station for communication with the Spitzbergen station.

A number of new motor factories, especially for marine motors, were started in 1912, and the manufacture of electric machines, telephone appliances, electric tramway cars, &c., progressed steadily. The construction of the underground tube electric tramline across Christiania through rock has proceeded apace.

Dynamo Brushes.—The agency for the dynamo and motor brushes made by Messrs. Sondermann & Co. has been taken up by MR. ARCHIBALD CAMPBELL, of 27, Chancery Lane, W.C. These brushes are of pure graphite, and a speciality is made of brushes for large machines with high commutator or slip-ring speeds. Both soft and hard qualities are supplied, and for A.C. machines the makers recommend their bronze (metal and carbon) brushes. Particulars are given in price list No. S 5.

Canadian Companies Consolidate.—A Halifax (N.S.) newspaper says :—The CANADIAN GENERAL ELECTRIC CO., LTD., who own and control, as subsidiary companies, the Canada Foundry Co., Ltd., and the more recent acquired Canadian Allis-Chalmers, have decided to consolidate the selling organisations of the two latter companies dropping the name "Canada Foundry Co., Ltd.," and conducting the selling organisations of both companies under the name of "Canadian Allis-Chalmers, Ltd." This policy has been adopted because the name Canada Foundry Co. does not appropriately cover the wide range of mechanical apparatus manufactured by that company, whereas the name Allis-Chalmers is synonymous with a very wide range of mechanical appliances and engineering works of magnitude, particularly in the manufacturing of Corliss engines, water wheels, saw mill machinery, mining machinery, cement machinery, flour mill machinery, gas engines, &c., and these lines will naturally be complementary to the products of the Canada Foundry, such as steam locomotives, hydraulic machinery, pumping machinery, structural steel work, &c. Hereafter all sales of electrical apparatus and supplies will be in the name of the Canadian General Electric Co., Ltd., and all general engineering contracts and sales of mechanical appliances in the name of Canadian Allis-Chalmers, Ltd.

Book Notices.—The July number of *The Chamber of Commerce Journal* contains a special supplement, entitled "Trade Products of the British Empire."

"Colliery Cables." By W. T. Anderson, M.I.M.E. Excerpt from the *Transactions* of the Institution of Mining Engineers. Copies can be obtained by application to Messrs. W. T. Glover & Co., Ltd., Manchester.

"Electrical Meters." By C. M. Jansky. 1913. London : Hill Publishing Co., Ltd. Price 10s. 6d. net.

"Manual of Electrical Undertakings and Directory of Officials." By E. Garcke. Vol. XVII, 1913-14. London : Electrical Press, Ltd. 21s. net.

"Report of the University of Leeds." 1911-12. Leeds : The University.

"*Proceedings* of the Physical Society of London." Vol. XXV, part IV, June 15th, 1913. London : *Electrician* Printing and Publishing Co. Price 4s. net.

"Resuscitation." By C. A. Lauffer, M.D. London : Chapman and Hall. Price 2s. net.

Fire Brigade.—A new fire brigade has been formed at the Osram Central Stores in Union Street, Southwark. At this department of the GENERAL ELECTRIC Co., the main stock of Osram drawn-wire lamps is stored, and most careful precautions must be taken to secure safety to the large staff employed and to the valuable stock. The fire brigade at the Osram Central Stores consists of 23 members, with Mr. C. Rennie as captain. Mr. W. Riley, formerly of the Metropolitan Fire Brigade, has been engaged as instructor. At present, weekly drills are being held under Mr. Riley's instruction. It has been shown that the staff can be dismissed from the premises, and the fireman be at their posts, in 30 sec.

Bankruptcy Proceedings.—A. P. PARKER, electrical engineer, Burnley.—Date of release of trustee (Mr. C. H. Plant, 13, Winckley Street, Preston), January 27th, 1913.

J. TIZZARD, electrical engineer, Torquay.—Date of release of trustee (Mr. A. E. Ward, 9, Bedford Circus, Exeter), January 30th, 1913.

T. TOPPING, electrical and mechanical engineer.—Date of release of trustee (Mr. E. D. Symond, 11, Dale Street, Liverpool), January 27th, 1913.

Liquidations.—MINERS' LAMP ELECTRIC LIGHTING CO., LTD.—This company is winding-up voluntarily, with Mr. J. Blackley, 42, Spring Gardens, Manchester, as liquidator.

UNIVERSAL STEAM TRAP SYNDICATE, LTD.—This company is winding-up voluntarily, with Mr. G. T. Harrap, 5, Budge Row, Cannon Street, E.C., as liquidator.

DISTRICT ELECTRIC CO., LTD.—Creditors must send particulars of debts, &c., to the liquidator, Mr. J. W. Hinks, 115, Colmore Row, Birmingham, by July 31st.

BULLOUGH'S ADJUSTABLE RAIL JOINT SUPPORT CO., LTD.—A meeting is called for July 28th, at 2, 4 and 6, St. John Street, Smithfield, E.C., to hear an account of the winding-up from the liquidator, Mr. Raymond Wells.

Meeting of Creditors.—*Re* BROWN & PARSONS, LTD., Leamington.—At the meeting of creditors in this matter, resolutions were unanimously passed appointing Mr. Charles Thomas Appleby, of Birmingham, voluntary liquidator of the company (in place of Mr. G. H. Butterworth), with a Committee of Inspection consisting of the Electric and Ordnance Accessories Co., Sandycrofts, Ltd., Sloan Electrical Co., and W. E. Mayo & Co., Ltd. A statement of affairs was read to the meeting by Mr. Butterworth, but the figures as regards the assets then given were merely estimates. The necessary order of the Court appointing Mr. Appleby as liquidator, with the Committee, was made on June 20th, and Messrs. Poppleton & Appleby have prepared a statement of affairs showing the liabilities at £1,576, and assets £791, leaving a deficiency of £785. In this statement of affairs they have not extended a claim alleged to be due to Mr. F. E. Brown, of £1,019, nor have they taken into consideration the debenture issued as part payment of the account only a short time ago to Mrs. Brown for £625. An offer has been made to purchase the whole of the assets of the company for £532, and in addition all claims (if any) under the debenture, or for money lent by Mr. Brown to the company, to be withdrawn. The Committee have instructed the liquidator to accept this offer, and it is anticipated that the creditors will eventually receive a dividend of about 5s. in the £.

Bankruptcy Proceedings.—WM. SLADE OLVER, consulting engineer, 298, Willesden Lane, Willesden.—Receiving order made June 25th on a creditor's petition. First meeting, July 8th; public examination, August 12th; both at Carey Street, W.C.

Catalogues and Lists.—The British Thomson-Houston Co., Ltd., 77, Upper Thames Street, E.C.—Folder illustrating the various types and sizes of Mazda drawn-wire automobile lamps, specially designed for motor-car service. In each class the lamp filaments have been constructed with the object of giving the most suitable distribution of light for the particular purpose. The Mazda headlight lamp, for example, has a very small helical coil of filament, approaching as nearly as possible the theoretical point source, so that when used in a parabolic reflector, all the light is thrown forward in a parallel beam.

Messrs. J. B. Guthrie & Son, 30, St. Mary Axe, London, E.C.—Illustrated price list of "Elasta" metal hacksaws.

Messrs. W. Geipel & Co., Vulcan Works, London, S.E.—Export price lists Nos. 134 and 135, the former dealing with Ward-Leonard rheostats, theatre dimmers and resistance units, and the latter with hand and automatic starters, switches, &c. The firm's London works have had to be extended.

The Westminster Tool and Electric Co., Suffolk House, Laurence Pountney Hill, London, E.C.—A set of half-a-dozen new illustrated descriptive and priced leaflets particularising the following series of Vulcan electric tools:—Single-speed electric drills; pillar drills; magnetic drill and reamer; magnetic chucks and fixing plates; electric grinders; electric drilling and grinding equipments; portable electric blowers and polishing motors.

Messrs. J. T. Niblett & Co., 183, Grove Lane, Denmark Hill, London, S.E.—Price leaflet relating to Niblett's new electric bleachers for removing stains, bleaching, disinfecting and deodorising.

British Westinghouse Electric and Manufacturing Co., Ltd., 14, Long Millgate, Manchester.—Folder with appropriate seabreeze cover, giving prices of Westinghouse electric fans for the 1913 season.

The Sun Electrical Co., Ltd., 118 and 120, Charing Cross Road, London, W.C.—New catalogue (Section D) of electric fans. In 20 pages are given brief illustrated particulars and prices of all types of fans suitable for domestic, office and industrial use, also the firm's special type of railway fan, such as they supply largely to Colonial and foreign railway companies. Desk and oscillating types, also a special combined fan and table lamp, and a combined fan and fruit dish, are listed. A second catalogue of 40 pages contains full information relating to Sun Holophanes, giving particulars, data, and prices of present standard Holophane glassware, and a large variety of fittings specially designed for use therewith. All recent patterns of this range of reflector are included. Copies of both of these catalogues will be forwarded on application.

Trade Announcements.—Mr. Guy Campbell, the sales manager of the Benjamin Electric, Ltd., of London, has joined the board of directors of the company as a managing director. The Benjamin Electric Manufacturing Co., of Chicago, and the Benjamin Electric Manufacturing Co., of Canada, Ltd., have large factories for the manufacture of the Benjamin electric lighting specialities for sale in their respective countries, while the Benjamin Electric, Ltd., manufacture at their London factory the material for the English and Colonial markets.

Mr. A. Golding, electrician, &c., has commenced business at Little Charles Street, Herne Bay.

Messrs. Farrar & Dyson, electricians, of Saltburn-by-the-Sea (Yorks.), announce that they are retiring from business. In consequence, the stock, &c., has been disposed of by auction this week.

Owing to the retirement of Mr. John Charles Garside, the business of Messrs. Chapman & Co., electrical engineers, of 5, Lodge Lane, Beeston, Leeds, has been taken over by Mr. Albert Ramsbottom.

The works of the Walsall Electrical Co., Ltd., will be closed to-morrow, Saturday, July 5th, for the annual outing.

Messrs. Babcock & Wilcox, Ltd., Oriel House, Farringdon Street, E.C., announce that owing to the rearrangement of the Telephone Exchange boundaries now being carried out by the postal authorities, their telephone number has been altered to "City 6470" (8 lines).

Messrs. Electric Control, Ltd., have removed their London office to Queen Anne's Chambers, Tothill Street, Westminster, London, S.W. Telephone No. "3240 Regent."

The Crompton Reconstruction Changes.—We are informed that Crompton & Co.'s scheme of reconstruction has been successfully carried through, and the new shares allotted. The additional capital will be a help to the business, which is being carried on under the old name. The new company takes over all the assets and pays all the liabilities of the old company. There are some changes on the board. Col. Crompton retired some months ago, and it will be remembered that Mr. Trotter, the late chairman, died in May. The new board has been strengthened by the addition of Mr. A. A. Campbell Swinton and Mr. W. Churchill Hale. Mr. A. J. Hodgson, for some years works manager, and latterly joint manager of Crompton & Co., resigned his position in November last, but, at the request of the board, continued his duties until the scheme for the reorganisation of the capital had been carried through and the question of his successor settled. The directors have appointed Mr. Thos. Britten, for many years with the Electrical Construction Co., as works manager, and Mr. Hodgson will be leaving Cromptons in August, when Mr. Britten takes up his duties. Mr. E. Reeves, joint manager of the old company, now becomes managing director.

British Works in Canada.—The *Canadian Engineer* says that the big industrial corporations of Great Britain and the United States are realising the significance of the rapidly-growing markets of Canada. "The United States Steel Corporation is establishing a large branch plant in Ontario, and the Sir W. G. Armstrong-Whitworth Co., Ltd., of England, will take a similar step, although their establishment will be in Quebec province The Canadian branch of this famous company will be used solely for commercial or civil or mechanical engineering, and not for naval or military work. At no time will the company make guns, boats, or anything of that nature here. This is, at any rate, in keeping with the spirit of the celebration of 100 years of peace in North America. They will manufacture twist-drills, punches, milling cutters, cranes, drop forgings, tool steel, &c. The decision of this large English corporation to erect a branch plant in Canada is a great event in Canada's industrial history. It indicates the confidence of keen and observant business men and capitalists in Canada's future, and that confidence is welcome and gratifying to Canadians. British capital will finance the entire enterprise, and no issue will be made in Canada."

LIGHTING and POWER NOTES.

Ayr.—The T.C., at a special meeting, has approved of terms for the extension of the electric lighting area, so as to include the burgh of Prestwick and the district of Alloway under the jurisdiction of the Ayr District Committee of the County Council. Under the terms of the agreement the Prestwick T.C. has power to purchase the undertaking of the Corporation within its boundary at the end of 30 years at a mutual valuation.

Barnstaple.—The T.C. has revised the tariff for current for power as under, as from April 1st last:—Up to 4,000 units per quarter, 2d. per unit; for the first 6,000 units, 1½d.; next 6,000, 1¼d.; beyond 12,000, 1d.

Barwell.—A parish meeting has decided by a large majority to approach the Leicestershire and Warwickshire Power Co. in regard to lighting the streets electrically.

Bath.—An illumination scheme has just been carried out in the Royal Victoria Park, by the Corporation. The part which has been lighted includes the bandstand and châlet, which have been outlined by over 2,000 lamps. The châlet has also been outlined so as to give an impression of its size, while the intervening space has been linked up by means of green, red, blue and amber festoons. The main entrance has also been treated, the ridges in the stonework forming the foundation, while the two pillars have been connected by a festoon of coloured and frosted lamps, upwards of 400 being utilised on this part of the scheme alone. The work, which has been carried out at a cost of £300, has been more than justified by the result.

Bexhill.—The Council has decided to alter all the arc lamps in the borough to high c.p. metal-filament lamps. The engineer estimates the cost of alteration at £3 10s. per lamp, a total of £122, and that the annual saving in cost of current will amount to £175.

Bexley.—The U.D.C. has decided to extend the facilities for the use of arc lamps for the outside lighting of shops, so as to apply to lanterns for use with 300 and 400-watt metal-filament lamps. The charge will be £4 and £4 10s. per annum respectively.

Bispham.—At a meeting of the D.C. last week the common seal was ordered to be fixed to a statutory notice of the intention of the Council to apply for a provisional order to supply electricity to Cleveleys.

The Electricity and Public Lighting Committee has recommended that after June 30th the price of electricity for heating and cooking purposes be reduced from 2d. to 1d. per unit.

Brentford.—The Board of Guardians has requested its Engineering Committee to report on the cost of providing a complete installation of electric lighting at the Union Offices, and also on the annual cost involved by the supply of electricity. A further suggestion was made by Mr. H. Evans that the Committee might also think it desirable to report on the electrifying of the whole of the establishments.

Bromley (Kent).—The West Kent Electric Co. has informed the T.C. that after the expiration of one month from June 10th it proposes to take advantage of its powers to lay various cables through London Road, High Street, Mason's Hill, and along Hayes Lane to the limits of the borough in that direction. As stated in a recent issue of the E.R., the T.C. recently objected to the laying of the mains in the town.

Canada.—Hydro-Electric Breakdown.—On June 16th a serious breakdown occurred in the Hydro-Electric Commission's supply, and as a result Toronto and the cities and towns of Western Ontario using this supply were without electrical energy for a period of five hours. Industrial plants, traction companies and street and residence lighting were all affected, while in Toronto the water supply ran short owing to lack of pumping power. Apparently it took a considerable time to locate the faults, one of which was found at Dundas, and the other was on the main transmission line.

Colne.—The T.C. has approved a recommendation from the Electricity Committee to the effect that from July 1st the charge for electric current for heating, cooking and other domestic purposes other than lighting, and where a lighting service already exists, be reduced to 1d. per unit through a separate meter.

Continental Notes.—SPAIN.—What is described as the largest steam turbine and generator set in Spain is about to be installed as a reserve plant at the power station of the Sociedad de Riegos y Fuerza del Ebro, in the Province of Barcelona. It will be arranged to come automatically into operation by means of a regulator operated by compressed oil. The turbine will be of 20,000-H.P. capacity, of the Curtis type, and is being built by the A.E.G.

Cromer.—The B. of T. has fixed July 15th as the date for an inquiry into the proposed transfer by the U.D.C. of the electrical undertaking to Messrs. Edmundson's Electricity Corporation, Ltd.

Hebden Bridge.—The L.G.B. has sanctioned the application of the U.D.C. for sanction to borrow £3,250 for extensions at the electricity works, the period for repayment to be 15 years. The Council asked that the repayment be spread over a period of 25 years.

Heston and Isleworth.—The total income of the Council's electricity undertaking for the past financial year amounted to £8,878, and after meeting working expenses, repayments of principal and interest on loans, and minor capital charges, there remains a net credit balance of £218. The output of current for the year totalled 1,094.789 units (compared with 1,040,774 for the previous year), and 848,403 of these were sold, as compared with 804,202 in 1911-12. Of this amount 262,202 were used for private lighting, 367,707 for power, and 218,094 for public lighting. The engineer expresses the opinion that in view of the growing prosperity of the undertaking, there is every reasonable hope for more concessions in the direction of reductions in the charges for lighting purposes.

Horsham.—The U.D.C. has received from the L.G.B. sanction to a loan for a refuse destructor, not in connection with the E.L. scheme as desired, but under the Public Health Acts.

Hull.—ANNUAL REPORT.—The report of Mr. Bell, the city electrical engineer, on the last year's working of his department, states that the total income of the undertaking increased from £67,773 to £75,287, a little over three-quarters of this increase being attributable to additional electricity sold for power, and the balance to sales for lighting consumption. The total costs of production amounted to £40,454, leaving a balance carried to net revenue account of £34,833, an increase over the previous year of slightly over £2,800. The gross profit was well maintained, in spite of the abnormal increase in the price of fuel during the year in question. The balance carried to reserve fund after payment of capital charges amounted to £7,755, an increase over the previous year of £1,254. The units sold amounted to approximately 10½ millions, being an increase of nearly 20 per cent. above those sold in 1912. The number of new consumers connected during the year amounted to 300, being considerably greater than the average of preceding years, and the cost of the necessary meters for same, all of which, in accordance with previous custom, have been purchased out of revenue, amounted to £625. During the period under review a considerable amount of renewal work was carried out, both at the power house and on the mains in the streets, in order to bring the plant generally into a safer condition to cope with the more onerous duties which electricity undertakings are now having to deal with. The motor hiring scheme, initiated by the Committee in 1905, showed a steady development, the total number of motors out on hire being 203, representing a total horse-power of 1,170. The income accruing from rentals from this source amounted to £1,040. During the year also very considerable additions were made both to the plant and mains of the department. The total works cost was 92d. per unit sold, and the maximum load 6,622 KW. Of the 10½ million units sold per meter, 8 million were for motor use, and public lamps took 85,000.

Ilford.—The electrical engineer has been directed to report upon the subject of fitting mechanical chain-grate stokers to the remaining boilers at the electricity works.

Ipswich.—The T.C. on June 25th decided to apply to the L.G.B. for a loan of £17,500 for mains, services, rental, wiring, and motors, boilers, and excess expenditure on mains. A further loan of £16,000 is to be sought for the extension of mains in the eastern suburbs of the borough, which are being rapidly developed, together with the provision of sub-stations, transformers, and switchgear.

Japan.—It is reported that the Anglo-Japanese Water Power Co. has decided to establish another electricity generating station on the Tenryu River, with a view to supplying a deficiency in the power caused by the breaches in the dam at the Oi River power station during the great flood of last autumn. When the new plant is completed, the company will have a total capacity of about 4,000 H.P.

Keighley.—The L.G.B. has sanctioned the application of the T.C. for additional borrowing powers in connection with the electricity undertaking, the periods of repayment being 11 years in connection with £1,100 for the provision of a cooling tower, and 17 years with regard to £6,800 for a new turbo-alternator.

In the annual report of the electricity department figures are given, which show that for the year ending March 31st the total number of units sold exceeded 3 millions. This year was the first during which the undertaking had been able to make a substantial profit, there being a net surplus on the year's working of £707, out of which it was proposed to discharge an outstanding debt of £355, leaving £353 to be carried forward. The outstanding debt on the undertaking is £59,296, and the return on this was an income of £12,472, equal to 20 per cent. on the capital outlay. The gross profit was increasing at the rate of £1,500 per annum, and at the present time represented 10 per cent. on the capital outstanding. The large power consumers had been the mainstay of the undertaking. The chairman of the Electricity Committee said that to meet the increasing demands on the undertaking, it would be necessary to prepare for the reception of another large generating set and auxiliary plant, and that when the Committee brought forward a proposal to ask for a further loan of £30,000 for this work, he hoped the Council would treat the matter in a broadminded manner. The report has been accepted by the Council, and it has been decided that when a consumer uses 4,000 units or over per half-year for lighting purposes, the charge shall be 2½d. per unit.

Kendal.—The general manager of the electricity undertaking reports that the total receipts for the year ending March 31st last amount to £1,480, as against an expenditure of £1,082, which leaves a gross profit for the 12 months of £398. After allowing for interest and instalment on loan, including bank interest and commission, this surplus is converted into a deficit £607. The total number of consumers now amounts to 161. The total number or equivalent of 8-C.P. lamps now connected is 9,755, representing an increase since last year of 731. The total number of units generated amounted to 101,359.

The L.G.B. has sanctioned the borrowing by the T C. of £800 for 25 years in respect of mains; £100 for 15 years in respect of services and £100 for five years in respect of meters.

London.—MARYLEBONE.—The L.C.C. is to be asked to advance the sum of £2,000 required in connection with the extension of the Council's electricity plant. The Finance Committee has approved the suggestion of the Electricity Committee, that the cost of meters should in future be met out of revenue surplus, instead of by means of a loan as heretofore. The Finance Committee reports having considered the statement of accounts of the electricity undertaking for the past year. The result of the year's working, the report states, shows a surplus of £4,014 which is less favourable than any year since 1909, and is about £2,800 less than was estimated for at the beginning of the year. Having regard, however, to the advance in the cost of fuel, which was beyond anticipations, and exceeded the estimates by some £4,500, and shows an increase of £6,600 in actual expenditure compared with the year 1911-12, the results achieved are a matter for congratulation. The Committee views with satisfaction the increase in sales of electrical energy, particularly as this is attributable to demands for purposes other than lighting. In regard to the special account set up dealing with apparatus on hire and its depreciation, expert opinion is that the amount (£1,500) set up as a reserve covers depreciation on a liberal scale. The conditions governing the payment of a bonus to the chief officers have been fully attained; the increase in sales has been 1½ million units, and the diminution in average price 8½ per cent., compared with the previous year, whilst the required conditions under the agreement are only ½ million, and 5 per cent. respectively.

Annual Report.—One of the most interesting annual reports is that of Mr. Seabrook, whose energetic action in developing 'other uses" is having a marked effect on the progress of the Marylebone electricity undertaking. The total income for the year was £212,564, and the expenditure £94,555, leaving a balance of £118 009. which, with interest, &c., gave a gross revenue of £118,354. Interest and sinking fund absorbed £114,350, leaving a balance for the year of £4,014. As regards the revenue, £165,770 was obtained from the sale of electrical energy, being rather less than was estimated. This reduction is attributed to the large adoption of 20-watt metal lamps in the borough, which, it is estimated, represents a loss in revenue of £7,000. Early closing has also had an effect on the output, and from this it is concluded that the largely increased output is attributable the use of electricity for domestic purposes other than lighting. The works and distribution costs amounted to £66,104, representing 1·057d. per unit sold, on 15,008,287 units, as compared with 1·009d. per unit on 13,488,698 units in 1911-12. Due to advance in price only, an additional £4,500 was paid for coal. The net cost of the sales and publicity department was £2,298, an increase which is attributed to the revised method of working introduced by which a large proportion of the orders obtained is sub-let to electrical contractors involving a lower margin of profit. The following table, dealing with connections and mains, is of particular interest in view of the rapid increase in the heating and cooking load:—

	1913.	1912.	1911.
Private lighting	15,499	15,286	14,992
Motors	3,314	2,883	2,486
Heating and cooking and other uses	6,321	3,922	2,771
Public lamps	422	397	393

The heating and other apparatus on circuit consists of 2,401 radiators of 2,820 KW; 620 cooking equipments of 2,047 KW., 605 irons of 205 KW., 524 medical equipments of 369 KW., and 973 sundry apparatus of 877 KW. The motors connected numbered 1,157, and the street lighting included 90 arc and 3,539 incandescent lamp columns with two or three lamps each. The station plant has a capacity of 12,000 KW., and the maximum load was 9,680 KW., the load factor being 17·7 per cent., and there were 9,234 consumers. The report contains some interesting curves showing the

progress of the undertaking generally, as well as statistical information.

Mexico.—All the reservoirs of the Mexican Power and Light Co. at Necaxa have now been brought into use; the water capacity is 6,000 million cb. ft., which will be sufficient to enable hydro-electric power to be supplied all the year round, and obviate the necessity of calling on the reserve steam stations in dry weather. The plant capacity of the Necaxa station is 127,500 H.P., and the average daily load will be 120,000 H.P. The company owns several other hydro-electric plants with an aggregate capacity of 21,400 H.P.

New Caledonia.—According to the *Board of Trade Journal*, a French company is carrying out works in connection with a hydro-electric plant which is to be installed for the production of ferro-nickel and ferro-chrome. Two generating stations are to be equipped, giving 17,000 and 7,600 H.P. respectively, the larger station being for the electro-metallurgical works.

Queensferry.—A Manchester electrical firm has approached the Hawarden R.D.C. with reference to an electric light scheme for this parish, and has submitted to the Council a scheme for its consideration. The residents have for some time desired a supply of electricity.

Siam.—A new company, known as the Société des Tramways et Electricite de Bangkok, has recently taken over the working of the electric tramcars and the supply of electrical energy for Bangkok, the capital of Siam. The tramway system comprises about 12 miles belonging to the Siam Electricity Co., and 10½ miles belonging to the Siamese Tramways Co., the receipts from the same amounting in 1912 to £80,468. The generating station, which supplies the current for the tramways and for public and private lighting purposes, has a capacity of 5,000 KW.; the output shows a steady increase, having advanced from 2,798,138 KW.-hours in 1909, to 3,942,385 last year. So far, no efforts have been made to secure clients for current for power purposes, but now that two new sets of steam turbines and generators, each of 1,200-KW. capacity have been installed, it is hoped to develop business in this direction among the rice factories and timber yards.

Skegness.—Messrs. Crompton & Co. have notified the Council of their intention to apply for a prov. order for electric supply in the area.

South Africa.—At a recent meeting of the Jagersfontein Council, the scheme for lighting the town by electricity, was discussed at considerable length. It was eventually agreed to ask for information from the various electrical companies, and to ask them to send their engineers to report on a scheme.

RAND LABOUR TROUBLES.—A serious strike has taken place on the Rand, and the strikers apparently appreciating the dependence of the mines on the Victoria Falls Power Co.'s electrical supply, have, it is reported, induced the men at the Brakpan and Simmerpan power stations to cease work, while efforts are being made to shut down the company's Rosherville station also.

Sunderland.—*Annual Report.*—The report of the Corporation electricity undertaking states that the receipts for the 12 months amounted to £69,543, made up by £17,240 for private lighting, £33,565 for power and heating, £11,267 for tramway traction and £2,876 for public lighting. After meeting all liabilities there remains a balance of £55,743 for repayment of loans, redemption of lands, superseded plant, &c. Nothing is to be applied to relief of rates.

Warrington.—*Annual Report.*—The report of the borough electrical and tramways engineer (Mr. Mathias) on the electric supply undertaking for the year ended March 31st, 1913, has just been issued, and shows that in the sales department the turnover has increased from £686 in 1912 to £1,759 in 1913, and the profit from £92 to £378. The gross revenue amounts to £21,842 and the working expenses to £12,530, leaving a balance of £9,311. Out of this has been paid interest on loans £2,667 and contribution to sinking fund £4,011, leaving a net profit of £2,944. The revenue from private lighting and power consumers is £15,514, representing 2,080,920 units, an increase of £1,022 and 230,227 units on the previous year. There are now 509 consumers connected to the mains. The average price obtained is 1·36d. per unit.

Wrexham.—The T.C. has decided to extend the mains at a cost of £100, so as to supply current to the new Miners' Rescue Station, and to supply current for lighting at 4½d. per unit and for power at 2d. As the station is outside the borough, the permission of the B. of T. and the R.D.C. to give the supply is being sought.

TRAMWAY and RAILWAY NOTES.

Australia.—According to dispatches from Perth, W.A., the Hon J. Scaddan (Premier), who favours railway electrification, to which he devoted special attention during his recent tour of Italy and England, has issued a special report, through Mr. R. P. Wilson, with reference to the proposed electrification of the Perth-Northam section of the trans-Continental line through the Darling Ranges. The electrification will cost £70,000, as against £250,000 in the case of the proposed new broad-gauge route.

Continental Notes.—AUSTRIA.—Thirty parcel delivery vans, battery-driven vehicles, have been placed in service on 15 postal routes in Vienna. It is estimated that during the year the vans will cover 496,000 km., making 182,000 journeys. Garage accommodation for 45 vehicles has been provided.

RUSSIA.—The St. Petersburg municipal authorities have placed orders for 320 (motor) tramcars and 180 trailers with various Russian and Swedish firms.

GERMANY.—In connection with the decision to electrify the Berlin Metropolitan and District Railway, the Government authorities are making experiments with lignite as a fuel for steam-raising purposes. If they prove successful, it is proposed to directly acquire mines in the lignite field, and there erect two large electricity generating stations for the supply of the necessary current for the railways. On the other hand, if lignite is found unsuitable, the stations would be established near Berlin, where water communication was possible to enable the necessary coal to be obtained from the mines in Upper Silesia.

Croydon.—*Annual Report.*—Mr. Goodyer's report on the tramways for last year was submitted to the B.C. on Monday. The traffic receipts for the year ended March 31st were £90,543, and other receipts £1,920. Working expenses were £66,218. This left a credit balance of £26,245. Subjected to interest, sinking fund and income-tax, it was reduced to £10,586. Of this sum, £3,000 went to the relief of the rates, and the remainder to the renewals fund, which amounts to £42,452, or 21·49 per cent. of the net capital expenditure. Traffic receipts decreased by £1,995, representing 345,087 passengers; and working expenses went up £4,568. The chief cause of the decrease in receipts was motor-'bus competition, the daily services having begun in December. Mr. Goodyer shows that the "public burden" borne by each tramcar was represented by £138 15s. 6d. (licence duties, rates and road maintenance), whereas for each motor-'bus the figure was £48 18s., made up of licence duties and petrol tax, not received by the borough. In other words, while the tramways contributed £11,096 to the local revenue, the motor-'buses paid nothing. "Legislation," says the report, "in the interests of the ratepayers, and those municipal authorities in the metropolitan area who have invested £13,000,000 in their tramway undertakings, is very urgently required, so that the services provided by the community, at the cost of the community, and in the interests of the community, should not be in a less favourable position than other competitive means of transport." The question of principle having at last been determined—as in the recent cases of the Chesterfield Corporation and the Rhondda Valley Tramways—the matter obviously (adds Mr. Goodyer) should be carried a step further, and applied to the metropolitan area, where the local authorities have no control over the licensing of public vehicles. The Tramways Committee recommended a resolution asking the Government to pass legislation putting motor-'bus companies and municipal tramway authorities upon equal terms in the matter of public obligations. This was unanimously adopted, with the report, on the motion of the chairman of the Committee (Councillor F. Denning, J.P.). An amendment referring back the paragraph in which the Committee declined for the present to make any recommendation regarding the long-proposed extension of the Addiscombe section to Woodside and South Norwood, was lost by a large majority.

Little Hulton.—It was stated on Tuesday that the South Lancashire Tramways Co. expects to open its new section through Little Hulton by the end of September—possibly earlier.

London.—METROPOLITAN DISTRICT RAILWAY.—Reporting to the B. of T. on the accident which took place near Sloane Square Station on April 26th, when four vehicles of an electric train were derailed, without injury to persons, Major Pringle states that it was due to the sudden breakage of an axle in the leading truck of the third car. A right-hand wheel dropped off the rail on the inside and broke a number of chairs, at the same time forcing the rail outwards. The fracture took place close to the centre of the axle, an unusual position, and was apparently due to an internal flaw; the axle was one of a batch of 400, and had run about 270,000 miles. No blame is attached to anyone. The last previous case of a broken axle on this railway occurred 4½ years ago.

MARYLEBONE.—The attention of the General Purposes Committee of the B.C. has been called to reports of evidence tendered to the Select Committee on motor traffic, upon the subject of the power which Borough Councils now possess to refuse consent to the laying down of tramways, &c., within their respective areas more particularly to the criticisms by important members of the L.C.C., on the manner in which the power is alleged to be exercised by B.C.'s., and as to the expediency of depriving metropolitan boroughs of the power. Being of opinion that the views of the B.C.'s upon this point should be placed before the Select Committee, the Committee has instructed the town clerk to make a representation to the clerk of the Select Committee upon the subject.

Mexboro'.—The District Council has had under consideration the decision of the House of Commons in regard to the Mexboro' and Swinton Tramways Railless Traction Bill, and has decided to appeal to the House of Lords against the decision of the Lower House.

Middlesex.—The County Council has come to an agreement with the Metropolitan Electric Tramways, Ltd., with regard to the company's Railless Traction Bill, whereby (1) the company will not oppose the County Council in its application to the Committee of the House of Lords requiring the insertion, in the Bill, of a clause giving the County Council power to purchase the undertaking in 1930; (2) the County Council will not oppose the removal

of the centre poles in High Road, Tottenham. The County Council has entered into an agreement with the Metropolitan Electric Tramways, Ltd., for reducing the car-mileage to be run on the route from Euston Road to Enfield, and on the route from Euston Road to Alderman's Hill.

New Zealand.—A service of electric tramway cars operated by Edison accumulators has lately been started in the town of Gisburn.

Oxford.—The Corporation Tramways Committee on June 25th had an interview with Mr. Cownie respecting a new scheme, by which it is proposed to run petrol-electric cars in High Street, Cornmarket Street and Queen Street, motor-'buses on the route now covered by horse 'buses, motor-'buses instead of tramways in St. Aldate's, and overhead traction on the Iffley Road route and the outskirts of the city. The Committee decided to recommend the acceptance of the scheme, and that Mr. Cownie's company should pay a rent of £500, instead of £300 as originally suggested.

Salford.—An estimate of £340 has been approved as the fees payable to the arbitrator and witnesses in connection with the arbitration as to the supply of electricity by the Eccles Corporation for Salford cars in Eccles. The Town Clerk reported that the reduced price of energy meant a saving (calculated on last year's consumption) of £346 per annum, or a total for the five years of £2,734.

Southampton.—The Tramways Committee has decided to appoint a general manager to take the entire control of the tramways undertaking. The commencing salary is put at £400 per annum.

Stalybridge.—At a meeting of the Stalybridge Joint Tramways Board on June 26th, it was reported that the loss on the year's working was £9,124. Alderman R. Wood pointed out that they had been stopped for a short time, during which they did not even earn interest and sinking fund. In 1905 they earned 6·57d. per car-mile, and last year, in spite of everything, they earned 7·88d. On track and overhead equipment they spent £2,000. Alderman W. E. Wood said the precepts on the four Corporations amounted to £2,281 each. He still believed that the undertaking would become a paying concern. Councillor Fowden said that to call on the ratepayers to provide £2,281 after nine years' working seemed to him to put the hallmark of failure on the concern. He thought they ought not to have agreed to increase the cost of current to the tramways undertaking, when they were selling current at such a low rate to ordinary consumers. He thought an investigation by impartial experts should be conducted. He moved that the accounts be referred back. This was defeated, and the minutes were confirmed.

Sunderland.—*Annual Report.*—The report of the Corporation tramways states that the traffic revenue for the year amounted to £68,507, compared with £67,871 for the preceding 12 months. The net balance is returned at £13,446, as against £13,063. The mileage of track totals 20·35. Working expenses totalled £38,921, leaving a balance of £29,950 to be carried to the net revenue account. It is proposed to apply £10,366 to the repayment of loans, £7,218 to reserve and renewals, and £5,000 to relief of rates. Since 1898, when the system was inaugurated, £42,027 has been allocated to relief of rates.

In order to facilitate interchange of traffic, the Corporation Tramways Committee proposed to give the Sunderland and District Tramways Co. running powers into the centre of the town to the extent of four cars per hour. The Town Clerk, however, has now informed the Corporation that it possesses no statutory power to give the permission as proposed.

Warrington.—The Tramways Committee hopes to inaugurate the new motor-'bus service in the course of the next two or three weeks.

TELEGRAPH and TELEPHONE NOTES.

A Cable Expedition.—The India-Rubber, Gutta-Percha and Telegraph Works Co.'s c.s. *Silvertown*, which had been for some time past berthed at Passage West in Cork Harbour, took her departure last Friday for the North Atlantic, there to repair the Direct New York Cable, which her sister ship, the *Dacia* (at present laid up at Passage West Docks), was engaged upon, and had to abandon owing to boisterous weather. The *Dacia* was obliged to put into Cork Harbour for safety some five weeks ago, and had subsequently to proceed to Passage West for repairs, where she is still in dock. The c.s. *Silvertown*, prior to her leaving Cork Harbour, took over the crew of the *Dacia*, numbering 191 hands, and also about 1,400 miles of cable. She had on board when leaving Cork Harbour three months' provisions, which cost about £1,500. She carried live stock in the form of bullocks and sheep to the value of £1,000. The intention in taking such a large quantity of live stock on board the *Silvertown* is that the vessel can be kept at the work of repairing the cable until it is successfully accomplished.

Betulander Automatic Telephone System.—A successful demonstration of this system, of which the Marconi Co. owns the patent rights in all countries except Sweden, was recently given by the Marquis Solari at the offices of the company in Rome, before a number of officials and engineers. The lecturer stated that Italy was almost the last of civilised nations to adopt the telephone, having only two subscribers per thousand of the population on January 1st, 1912.

Brazil.—In the *Messager de Sao Paulo* for May 31st, an account is given of the system of the Companhia Rede Telephonica Bragantina, which was founded in 1896, and having obtained various concessions and acquired a number of other companies, now possesses a network connecting more than 300 townships, with trunk lines aggregating 19,400 km., in addition to the lines of 4,500 subscribers, with 180 exchanges. The whole of the equipment was made by the Western Electric Co., Ltd.

Imperial Wireless System.—At the meeting of the Select Committee on Wednesday, Mr. Samuel, the Postmaster-General, stated that the Government did not intend to attempt to enforce the execution of the contract with the Marconi Co., which the latter repudiated in January last. No legal action, in fact, could be taken unless the contract was first ratified by Parliament, and it was questionable whether the Courts would award damages against the company, in view of the long period which had elapsed (through no fault of the company) since the contract was entered into. The Government now held themselves free to enter into a new contract. The Committee decided to report to the House of Commons that, as the contract was not to be enforced, it was unnecessary to go on with the inquiry.

Japan.—Some experiments have just been made at Yokohama under the direction of the Japanese Department of Communications with a new system of wireless telephony invented by three Japanese. Messages have been successfully exchanged at distances of 45 and 60 miles.

London-Paris Telephone.—The Postmaster-General has informed the British Chamber of Commerce in Paris that he hopes shortly to be able to introduce reduced telephone rates between London and Paris, including a night tariff of three-fifths of the ordinary day rate.

Marconi Libel Action.—An action for libel, brought against the Berlin paper *Die Welt am Montag*, by Mr. Marconi, has been settled, the journal having undertaken to print an apology and to withdraw the objectionable statements, which suggested that the complainant had admitted that his company sought to make money out of the disaster to the *Titanic*.

New Atlantic Cable.—The Portuguese Parliament has adopted a Bill for the laying of a telegraph cable from Portugal to Panama.

Norway.—The Storthing has sanctioned the agreement with the Marconi Co. for establishing a wireless telegraph service between Norway and America, and has voted the sum of 2,000,000 kroner (about £111,100) for the construction of a station near Stavanger. Marconi's Wireless Telegraph Co., Ltd., will immediately start the erection of a station in Norway, and the American Marconi Co. will commence the construction of the station on the other side of the Atlantic.

Poulsen System.—A correspondent of the *Morning Post* says that a new company is being formed in Copenhagen for the purpose of taking over all the Poulsen wireless communication between Scandinavia, on the one hand, and Greenland, Canada, the United States, the Danish West Indies, and Panama on the other. At Panama the United States Government intends to establish a powerful Poulsen station. The company is backed by a powerful financial group, including the Landmandsbank.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Victoria.—August 4th. (*a*) Twin surface condensers, hotwells, piping and sundries; (*b*) air and water extraction pumps and motors; (*c*) circulating water and sump pumps, with motors, for the Melbourne Suburban Railways power house. See "Official Notices" June 13th.

September 16th.—Switchboard, C.B. or automatic or semi-automatic, at Collingwood. See "Official Notices" to-day.

Queensland.—August 27th. Five sections of common-battery multiple switchboard, for the P.M.G.'s Department. See "Official Notices" to-day.

September 10th.—Nine sections of trunk line switchboard, for the P.M.G. See "Official Notices" to-day.

Western Australia.—August 6th. Telegraph and telephone material, for the P.M.G.'s Department. See "Official Notices" to-day

July 30th.—Cable, switchboard, for the P.M.G. See "Official Notices" June 27th.

July 19th.—Switchgear and accessories for an electric power station at Perth. See "Official Notices" June 27th.

SOUTH AUSTRALIA.—August 13th.—Common battery switchboards and telephone parts for Adelaide. See "Official Notices" to-day.

ADELAIDE.—July 29th. Municipal Tramways Trust. Bonding material. Specification (21s.) from Mr. W. G. T. Goodman, Hackney Road, Adelaide.

NEW SOUTH WALES.—August 20th. Pneumatic ash-handling plant for the White Bay power house. Specification No. 415 (5s. each) from Electrical Engineer's Office, 61, Hunter Street, Sydney.

SYDNEY.—August 27th. Telephones, switchboards and incandescent lamps, for the P.M.G. See "Official Notices" to-day.

Belfast.—July 21st. One 3,500-ampere traction switchboard panel, for the Corporation. See "Official Notices" to-day.

Belgium.—July 7th. The municipal authorities of Romée (province of Liége) are inviting tenders for the concession for the public and private electric lighting of the town.

July 12th.—Tenders are being invited by the Belgian telegraph authorities in Brussels (Salle de la Madeleine) for the supply and laying of a quantity of telephone cable in the town of Louvain.

The municipal authorities of Farciennes (province of Hainaut) have just invited tenders for the establishment of a central electric lighting station in the town.

Birkenhead.—July 14th. Low-tension main cable, and india-rubber lead-covered and armoured service cable for the Corporation. See "Official Notices" June 27th.

Eccles.—July 21st. Mechanical stokers for four Lancashire boilers at the electricity works, Cawdor Street, Patricroft. Borough Electrical Engineer.

India.—An announcement appears in our advertisement pages to-day from which it will be seen that the Government authorities are prepared to grant licences under the Indian Electricity Act for supply within the municipalities of Allahabad, Lucknow, and Bareilly.

Kingston-on-Thames.—The T.C. is inviting tenders for about 2,000 tons of coal for the electricity works.

London.—HACKNEY.—July 24th. Extra-H.T. ring main conduits, sub-station plant, switchgear and cranes, for the B.C. electricity department. See "Official Notices" June 20th.

H.M. OFFICE OF WORKS.—July 18th. Supply of electric cable and wire during one year from September 1st, 1913. See "Official Notices" to-day.

Malta.—July 10th. Arc lamp carbons. Forms of tender from Crown Agents for the Colonies, London. Tenders to Receiver-General and Director of Contracts, Valetta.

Newport (Mon.).—July 19th. Extra-high-tension switchgear, for the Corporation. See "Official Notices" to-day.

Norway.—The Norwegian Telegraph authorities in Christiania have just invited tenders for the supply of 400,000 metres of telegraph cable.

Nuneaton.—July 15th One line booster for the Electricity Committee. See "Official Notices" to-day.

Oldham.—One 2,000-KW. steam turbine, coupled to extra-H.T. A.C. generator, also barometric condenser, pumps, &c., for the Corporation. See "Official Notices" June 20th.

Roscrea.—July 11th. Roscrea Bacon Factory, Ltd., invite tenders for buildings, gas engine and suction plant, dynamos, battery, switchboard, overhead feeders, mains and street lamps, for the electric lighting of the town. See "Official Notices" June 27th.

Rotherham.—July 8th. Tramway stores, coal, cable and meters, for the Corporation. See "Official Notices" June 20th.

Roumania.—July 25th. The municipal authorities of Roshiorude Vede are inviting tenders for the concession for the electric lighting of the town.

August 7th.—Concession for the electric lighting of the city. 409,987 fr. Particulars of the Municipality.

Salford.—July 9th. Two-phase switchgear, Scott transformers and regulators, for the Electricity Department. See "Official Notices" June 27th.

Scarborough.—July 12th. Electric light installation at the Workhouse and Infirmary, for the B.G. (about 360 lights). Tennant and Barrs, consulting engineers, Cathedral Buildings, Dean Street, Newcastle-on-Tyne (returnable deposit of £5).

Spain.—August 27th. Construction and working of an electric tramway in the town of Vigo. An option on this concession is held by the "Compañia anónima Tranvías Eléctricos de Vigo."—*Board of Trade Journal.*

July 9th.—The municipal authorities of Salvaleon (province of Badajoz) are inviting tenders for the concession for the electric lighting of the town during a period of ten years.

MADRID.—August 9th. Concession for an electric tramway from Braeza to Linares. Particulars from the Ministerio do Fomento, Madrid (Department of Public Works).

Taunton.—July 7th. Extensions to boiler house, &c., and setting new boiler at the Corporation electricity works. Borough Electrical Engineer, St. James's Street.

West Ham.—July 10th. Electric light installations for the Forest House branch workhouse and Forest House cottages, Leytonstone, for the Union. See "Official Notices" June 27th.

Warrington.—July 8th. The Electricity and Tramways Committee. 10,000 tons of slack for delivery at the electricity works, Howley. Mr. F. V. L. Mathias, borough electrical and tramways engineer.

CLOSED.

Atherton (near Manchester).—The U.D.C. has accepted the tender of the British Electric Transformer Co. for two 150-KW. single-phase transformers.

Belfast.—The Tramways Committee has decided to accept the tender of Messrs. Dick, Kerr & Co. for permanent way renewals.

Bispham.—The U.D.C. has accepted the tender of the National Gas Engine Co., Ltd., for additional plant at the electricity works.

Bolton.—The Electricity Committee has accepted the tender of Messrs. Newton, Chambers & Co., Ltd., for feed tanks at Back-o'-th'-Bank, and that of Messrs. Musgrave & Co., Ltd., conditionally, for condensing plant.

Canada.—REGINA.—The City Commissioners of Regina, Saskatchewan, have just ordered from Messrs. Bruce Peebles & Co., Ltd., through that firm's Eastern Canadian agents, a 1,200-KW. motor converter (Peebles-La Cour patents).

Chester.—The following tenders have been accepted in connection with the extensions at the electricity works:—

Tudor Accumulator Co., Ltd.—Battery (No. 8), £7,470.
Lancashire Dynamo and Motor Co., Ltd.—Booster (No. 4), £1,145.

Croydon.—For the lighting of Thornton Heath new fire station and Public Library, for Croydon Corporation, the tender of Messrs. Hawkins & Sons, London, has been accepted at £376. Highest tender, Messrs. O. Jones & Co., Beckenham, £596 6s. 6d.

Doncaster.—Mr. W. H. Pease has received from the Corporation a contract for the telephone installation for the Racecourse.

Dover.—The *Times* states that the Corporation has accepted the tender of Messrs. Paramors, Margate, for constructing, at a cost of £15,062, the roadway and tramways on the viaduct to be built at the pier as an approach to the new marine station.

Edinburgh.—Messrs. Provincial Cinematograph Theatres, Ltd., of London, have recently accepted the following contracts in connection with their new picture house, Princes Street, Edinburgh:—

Electrical installation (exclusive of fittings).—Malcolm & Allen, £875.
Heating and ventilation plant (exclusive of fans and motors).—Mackenzie and Moncur, £1,244.
Domestic hot-water supply.—Morrison & Son, £143.

Kingston.—The T.C. has accepted the tender of the Craigpark Electric Cable Co. for the supply of 880 yd. of 1 sq. in. L.T. cable, at £198; 440 yd. of 7/18 L.T. cable, at £39 15s.; and 440 yd. of 7/16 L.T. cable, at £47 10s.

London.—Messrs. Mitchells, Ashworth, Stansfield & Co., Ltd., London, E.C., have received an order for about 1,410 sq. ft. of their "Mascolite" B.U., 1¼ in. thick, to absorb vibration and deaden sound, to be placed between the main and lower concrete foundation on which are to be erected three Diesel engines at the Flood Street generating station of the Chelsea Electricity Supply Co.

The tender of Messrs. W. J. Fryer & Co., Ltd., has been accepted by the Metropolitan Asylums Board, at £75 10s., for wiring the open-air balconies at the Brook Hospital, Shooter's Hill.

L.C.C.—The Highways Committee has received the following tenders for high and low-tension cables for the tramway undertaking, and for maintenance purposes during the current financial year:—

Western Electric Co. .. .. .. (recommended)	£25,410
Johnson & Phillips	26,018
Siemens Bros. & Co., Ltd.	26,169
W. T. Henley's Co.	26,187
Callender's Cable Co.	26,942
W. T. Glover & Co.	27,201
B.I. and Helsby Cables	27,838
Chief officer's estimate,	£24,000

Tenders are to be invited from selected firms for 1,000 ordinary plough leads and 3,500 sliding contact leads for electric cars, owing to the large number of cars now being fitted with trolleys and plough collector gear for through running and other causes.

Melton Mowbray.—The U.D.C. has received the following tenders for the provision of a refuse destructor:—

Horsfall & Co., Ltd.	£1,691
Hughes & Stirling	1,881
Dawson & Manfield	1,950

Installations by the respective firms are to be inspected before the contract is placed.

Leyton.—Messrs. T. Bolton & Sons, Ltd., are to supply 1 mile of trolley wire to the U.D.C.. The price quoted was 8 1/8d. per lb. Other tenders received were :—

F. Espir, Ltd.—9½d. per lb.
F. Smith.—9½d. per lb.
B.I. and Helsby Cables, Ltd.—9½d. per lb.
Equipment and Engineering Co., Ltd.—10d. per lb. for Phono-electric trolley wire.

The tender of Messrs. B. Thomas has been accepted, at £104, for a switchboard panel. Messrs. Johnson & Phillips quoted £110.

The U.D.C. has accepted the tender of Mr. J. T. Halsey for installing the electric light at Church Road Schools, at £376.

Peterborough.—The T.C. has accepted the tender of Messrs. Beeby & Son for from 2,000 to 2,500 tons of Seiston hard steam coal for the electricity works, at 16s. 6d. per ton.

Salford.—The following tenders have been accepted by the T.C. :—

Halliwell & Co.—Wiring the new Secondary School for boys, £342.
Brush Electrical Engineering Co., Ltd.—One double-deck single-truck tramcar body, with vestibule ends, £530; nine additional car bodies of a similar character, £500 per car body. (This price is subject to a reduction of £30 per car body if, after experiments, it is decided not to adopt vestibule ends.)
J. G. Brill & Co.—Ten Brill tramcar trucks, less wheels and axles, £548.
Walter Scott, Ltd.—1,000 tons Sandberg steel tramway rails, £7 7s. 6d. per ton. (In addition to this price, a royalty of 8s. per ton is to be paid to Mr. Sandberg.)
Buxton Lime Firms, Ltd.—Annual supply of lime for the water-softening plant at the generating station, 26s. per ton.

The following tenders have been accepted for supplies during the period ending March 31st, 1914 :—

Motor starters—H. G. Mabbs, approximate value of contract £375.
Electricity meters.—Chamberlain & Hookham, £600; General Electric Co., Ltd., £380; Ferranti, Ltd., £100.

Southampton.—The following tenders have been received by the T.C. for electrically lighting the Regent's Park School :—

I. Groves & Co.	(accepted) £195
F. W. Cook & Co.	246
J. Davis & Co.	249
A. Kingman & Co.	263
W. Dibben & Sons	342

Stalybridge.—The Joint Tramways and Electricity Board has accepted the following :—

Goodbrand & Co.—Economisers.
Storrs.—Concrete bed for boilers.
Ed. Wood & Co.—Supply and erection of steelwork for boiler house.
Babcock & Wilcox.—Feed-water heater.
Ellis & Son.—Weighbridge.

Warrington.—For a supply of motors, the tender of Messrs. Veritys, Ltd., has been accepted by the T.C.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, July 4th. Leave London for excursion to Brussels.
Saturday, July 5th. Visit to Ghent Exhibition.
Sunday, July 6th. Excursions to Dinant, the Valley of the Meuse, the Field of Waterloo or Antwerp.
Monday, July 7th. Visit to places of interest in Brussels. Return to London in the evening.

Salford Technical and Engineering Association.—Saturday, July 5th. Visit to Central Fire Station, London Road, Manchester.

Glover's Almanac.—Messrs. W. T. Glover & Co. have sent us their twelfth almanac, which, as usual, is composed of extracts from technical publications, interesting pictures, humorous skits and sketches, &c. We cannot doubt that a vast amount of labour has been expended on this unique production year by year, and the editors, as well as Messrs. Glover's, merit our congratulations on the admirable result. We venture to print the item for to-morrow, taking the risk of an action for breach of copyright :—

DE PROFUNDIS.

The crew let fall, with a rattle and splash,
A drum of cable in Table Bay
(The captain's remarks we will print with a ——.
The captain had rather a lot to say.)

He finished with "blithering, yellow-eyed lubbers,
That insulation's tarnation wet;
Sea-water jiggers the tapes and rubbers—
What sort of test will the mainsman get?"

The bo'sun hoisted his slacks and spluttered,
"The watter don't matter," says he to him;
"There's GLOVER'S writ on the side," he stuttered,
"And DIATRINE printed round the rim."

So they hauled it back ("Heave ho! Aye, aye, sir,")
With block and tackle, as Jack'll tell;
And the consignees were never the wiser—
Glover's had covered it up too well.—H. M. L.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued for the current week :—

Monday, July 9th to 18th.—Headquarters will be opened daily from 10 a.m. till 4 p.m.
Saturday, July 14th.—Headquarters will be opened from 10 a.m. till 12 noon.

(Signed) P. H. CAMPBELL, Capt. R.E., Adjutant,
For Officer commanding L.E.E.

NOTES.

£250 Still Wanted for the Electrical Trades Benevolent Institution.—We have received the following letter for publication :—

"On my return from Australasia I was much gratified to hear of Mr. G. Byng's splendid offer, namely, to give £100 to the funds of the Electrical Trades Benevolent Institution if £1,000 could be raised in individual amounts of not less than £50 each before July 16th, 1913.

"I am, however, surprised to find that over two months have gone by and the donations are still short of the amount of £250 required to enable the Institution to obtain the benefit of Mr. Byng's offer.

"In view of the large number of wealthy persons connected with, and benefiting by, the electrical industry, this appears to me an extraordinary state of affairs.

"The main object of the Institution is to grant pensions to deserving and necessitous persons who have been on the staff of electrical firms. Such pensions, for obvious reasons, can only be paid out of the interest or dividends on invested funds; the present income from this source (about £125) is quite inadequate to meet any serious demand. The invested funds must therefore be increased without delay.

"The calls on the Institution for grants for temporary relief are increasing steadily, although the Committee has fortunately been able to keep the sum of the grants down to a low figure by its success in obtaining employment for most of those persons whom the Institution has assisted; it may interest you to know that no qualified person who has applied for assistance has failed to receive it.

"Yours faithfully,
"JUSTUS ECK,
"*Chairman of the Committee.*

"London, E.C., *June 30th*, 1913."

Correspondence Tuition.—In the columns of the ELECTRICAL REVIEW and other electrical and engineering papers advertisements frequently appear of "Tuition" by means of correspondence. Some of these are absolutely genuine, and others, unfortunately, quite the reverse. The editors will at all times be glad to hear from students and others of unfair or unbusinesslike treatment on the part of such advertisers, with a view, if possible, to eliminate from the ELECTRICAL REVIEW advertisements of the undeserving.

The "Point Five Association."—Mr. J. W. Beauchamp, West Ham, was elected a member of the "Point Fives" at the meeting on June 17th.

An Inventor Disengaged.—A correspondent writes :—"I belive there is a lot of room for inventions, would you kindly let me know one or two that are wanted, electricial or otherwise, and oblidge, yours faithfully." There are, we believe, two or three inventions that might very well be invented; such things as upward screws for shift engineers, ring-fences for consulting engineers, politician-fenders for wireless companies, and padlocks for 'oisters, leap to the imagination.

Annual Sports and Outings.—The fourth annual outing of the BRIMSDOWN LAMP WORKS was held on Saturday, June 28th, when the employés, including also the staff of the head offices in Kingsway, journeyed at an early hour to Southend-on-Sea. Glorious weather prevailed throughout the day, and the endless amusements at this popular seaside place were inundated with hundreds of "Wirumites." Luncheon was served in the "Kursaal." Mr. C. Reiss, managing director of the company, was in the chair, and on rising to give the loyal toast, he was accorded a great reception. Mr. Brunessaux proposed the toast of "The Brimsdown Lamp Works: its Managing Director and Works Manager," which was vociferously honoured. In response Mr. Reiss made a rousing speech dealing particularly with the excellent relations existing between the management and the executive staff. He mentioned that there was every indication for a very bright and prosperous future. At the conclusion of this speech the party adjourned for a photograph to be taken, after which the members were free to enjoy themselves in their own way. The outing is described as a huge success.

The ninth annual amateur athletic sports of the Croydon Corporation Tramways Athletic Club were held on Wednesday afternoon on the Brighton Railway Athletic Club Ground, West Croydon. Prizes, cups, &c., aggregating £140 in value were awarded for the different events, which included a one mile flat race (handicap) for the Tantalum

challenge cup, presented by Messrs. Siemens. This cup, competition for which is open to tramway employés in the United Kingdom, becomes the property of the man who wins it for three years in succession. The Croydon Corporation Tramways Military Prize Band was in attendance (Bandmaster, Mr. W. Ellis). We shall refer to this more fully next week.

The twenty-fourth annual cycling and athletic sports in connection with the ARC WORKS' CLUB were held on the Wood Street Ground, Chelmsford, last Saturday week. The prizes were distributed by Mrs. Carleton Tufnell, who was cordially thanked, on the motion of Mr. A. J. Hodgson. Music was rendered by the Arc Works Silver Band and the Essex Industrial School Band. In the evening there was a *fête*, with dancing, fireworks, &c. The secretarial duties were carried out by Mr. Percy G. Cheverton.

The employés of Messrs. Bruce Peebles & Co., Ltd., of Edinburgh, went for their annual excursion on Saturday last, St. Andrew's being the place selected. The morning was occupied with the usual sports, while the afternoon was spent in visiting the many places of interest in the neighbourhood. Lunch and tea were served in the Town Hall, where the sports prizes were distributed. The whole outing proved a thorough success.

The Veritas Athletic and Social Club (Messrs. Falk, Stadelmann and Co., Ltd.) held their fifth annual athletic meeting at the Kingsdale Track, High Beech, on Saturday last.

On Saturday last the staff and employés of the Osram and Robertson Lamp Works held their annual outing, which this year extended to Ventnor, with a call at Southsea *en route*. A start was made before 8 a.m. for Portsmouth, where some time was available for local visits before lunch, the latter being served at the Central Hotel, with Mr. Chris Wilson, the general manager, who is also the president of the Works Social Club, in the chair. This was an informal function, and we only need mention the drinking of the genial chairman's health with musical honours. Subsequently a move was made to the special steamer which had been chartered to convey the party to Ventnor, and the very pleasant voyage round the sunlit shores of the Isle of Wight was most enjoyable. After tea, at the Metropole Hotel, the visitors returned by water to Portsmouth, there entraining for London, which was reached at a late hour. Delightful weather conditions prevailed; and this, coupled with the informal character of the day's proceedings, and the determination of "President Wilson" and his staff to keep things going, contributed to a very successful outing.

On June 28th the International Electric Co., Ltd., of Kilburn, N.W., held their annual outing, when upwards of 100 of the company's employés travelled to Brighton. The party dined together under the chairmanship of Mr. H. R. Roose, the managing director, who, responding to the toast of "The Firm," referred to its increasing prosperity, and urged the continued co-operation of all present. The "Intelco's" dispersed for various amusements during the afternoon, to reassemble at tea, and the return journey to town ended what was unanimously voted a most enjoyable day.

On Thursday last week the employés of the Urban Electric Supply Companies of Newton Abbot and Dartmouth held their annual outing. They journeyed to Plymouth by reserved saloon carriage, where breakfast was served, and two members were presented with pipes in recognition of services rendered. The recipients having suitably responded, a start was then made for Calstock by motor-boat. After dinner the annual cricket match between the two staffs was played. Dartmouth batted first, and, thanks to a good innings by Macey (19), made 36 runs, to which Newton Abbot responded with 44 for nine wickets, thus proving victors. The outstanding features of the game were a splendid innings for Newton by Prudence (21) and good bowling by Carpenter and Stratford, who did well considering that the pitch resembled a miniature golf links. At the dinner a presentation was made to Mr. G. E. Smith, on behalf of the subscribers, by Mr. A. C. Evans. A move was then made for Saltash, and after tea the company enjoyed the rest of the evening in divers ways.

The Strikes on the Rand.—Reuter's representative at Johannesburg states that the men employed at the Brakpan power station of the Victoria Falls Power Co. have come out at the instigation of the strikers' procession. "The company, from its three stations at Brakpan, Rosherville and Simmerpan, supplies the bulk of the industry with light and power. The paralysis of the Victoria power system would mean the paralysis of the whole industry, except the Randfontein and East Rand Proprietary Mines, who have their own power plants. . . . Urgent representations are being made to the Government for increased protection, specially in view of the vulnerability of the Victoria power system." A good deal of later information has appeared in the Press respecting the safety of the power stations. It is stated that the Victoria Falls and Transvaal Power Co. has received cabled information that the operating and maintenance employés at the Brakpan, Simmerpan and Rosherville power stations have joined the strikers. No damage, however, has been done to the property.

Batti Wallahs' Society. — About 70 members and friends enjoyed the up-river trip on Saturday last. A start was made from the Sun Hotel, Kingston, and the party reached Chertsey in time for 5 o'clock tea. Thanks are due to the ladies, the weather, and the musical friends for combining to give what is described as one of the jolliest outings the society has had.

Appointments Vacant.—An electrical inspector is required by the India Office for the United Provinces of Agra and Oudh (Rs. 600 to Rs. 800 per mensem); shift engineer for Swansea Harbour Trust (42s.); assistant shift engineer for Battersea (£2); assistant teacher of electrical engineering and teacher of telephony for Acton and Chiswick Polytechnic; driver and switchboard attendant for Stoke-on-Trent electricity works. See "Official Notices" to-day.

The L.C.C. Conciliation Boards.—The London County Council has followed up its approval of the conciliation scheme outlined in last week's issue by appointing the following gentlemen to represent it. There are four boards, and the Council has power to appoint six representatives on each, of which not more than two may be officers of the Council:—

(*a*) Traffic Conciliation Board.—Mr. H. E. A. Cotton, Mr. G. H. Hume, Mr. Cyril Jackson, Capt. A. C. H. Kennard, the chief officer of tramways and the deputy chief officer of tramways.

(*b*) Rolling-Stock Conciliation Board.—Mr. W. Hunt, Mr. W. J. Squires, Mr. R. L. Stuart, Sir Edward White, the chief officer of tramways and the tramways rolling-stock superintendent.

(*c*) Electrical Conciliation Board.—Mr. A. O. Goodrich, Mr. H. H. Gordon, Mr. Theodore Prestige, the Lord Alexander Thynne, the chief officer of tramways and the tramways electrical assistant.

(*d*) Permanent-Way and Building Conciliation Board.—The Lord Monk Bretton, C.B., Mr. A. Cooper Rawson, Mr. A. H. Scott, Mr. A. W. Yeo, the chief officer of tramways and the tramways permanent-way engineer.

The conciliation boards are already at work, as by agreement on the rolling-stock conciliation board and confirmation by the Council the pay of armature winders has been increased from 9½d. to 10d. per hour. As a further proof of their usefulness, it has been decided, on the recommendation of the sectional board, to increase the clothing allowance for shunters and traversemen by an overcoat every two years at a cost of about 24s. per coat.

A further question, dealing with the status and pay of controller repairers and light and power attendants, has been referred back for reconsideration by the rolling-stock sectional board. These matters seem small, but it is worth much to the smooth working of the undertaking to have a ready means of preventing their becoming grievances.

Institution and Lecture Notes.—INSTITUTION OF ELECTRICAL ENGINEERS.—On Thursday evening last week the annual conversazione of the Institution was held at the Natural History Museum; Mr. W. Duddell, F.R.S., president, with Mrs. John Smithers received the guests. The String Band of the Royal Engineers provided a musical programme, and the Royal Windsor Glee Singers gave a concert in the Shell Gallery. Amongst those who were present were General Sir R. Biddulph, Commander W. F. Caborne, Sir J. Crichton-Browne, Sir William Crookes, Sir John Gavey, Colonel Sir T. H. Holdich, Major-General Beresford Lovett, Major W. A. J. O'Meara, Sir C. H. Read, Baron de Ropp, Colonel Sir J. S. Young, and many distinguished members of the electrical and kindred institutions.

ROYAL SOCIETY OF ARTS.—The annual meeting was held on June 25th, Lord Sanderson, G.C.B. (chairman of the Council), in the chair. The report of the *Proceedings* of the Society during the past year was read, and H.R.H. the Duke of Connaught was re-elected president; 35 new members were elected, making a total of 238 elected during the session.

INSTITUTE OF MARINE ENGINEERS.—On June 14th a large party from the Institute visited the Chelmsford Works of Messrs. Marconi's Wireless Telegraph Co., Ltd. The two steel masts for the aerials, 470 ft. in height, are now a conspicuous feature of the works. They are 4 ft. 6 in. in diameter, up to a height of 450 ft., and are made of ½-in. pressed steel in sections of 15 ft., the distance between them being 700 ft. Demonstrations and explanations were given of the various instruments under working conditions, including a ½-KW. set, as used on cargo vessels.

An Emergency Plant.—Owing to breakdown and immersion of the main steam-driven pump, which was likely to cause a stoppage of the main outlet of coal of the Aberpergwm Collieries Co., Ltd., Glyn Neath, South Wales, it was decided to install a Rees-Roturbo four-stage centrifugal pump, direct driven by a 60-H.P. B.T.H. Co.'s squirrel-cage motor, with compensator starter suitable for 3,000 volts. The difficulties encountered may be realised by the fact that all the gear, having a total dead weight of 5½ tons, had to be taken down underground along an incline dipping 18 in. per yard, for a distance of over 250 yards, with 4 ft. headroom, and had to be taken down on skids to save laying a special road. The handling of the work, including erection of pump, &c., running of cables and connecting up was carried out by the company's electrical engineer. Mr. J. Glynn Williams, Vice-President of the South Wales Branch of the Association of Mining Electrical Engineers, of which he was the original founder. In recognition of the quick time in which the work was done and pumping operations commenced, he was presented with a massive gold ring by the manager, Mr. Rees Howells, and a cheque by Mr. M. Ogilvey Spence, agent to the colliery company. So successful was the installation of this pump, that last week-end was the first for some considerable time that a suspension of pumping operations from Saturday to Monday was possible, which, coupled with the electrification of the ventilating fan drive, makes a very considerable saving to the company.

The Engineering Labour Unrest.—The *Morning Post* states that the wages of 10,000 labourers engaged in the Sheffield district engineering trades have been raised by an agreement just concluded at a joint conference of the Engineering Employers' Federation and the National Gasworkers' Union.

Sentence.—At the Westminster Police Court on Tuesday, Ernest Augustus Gilles was sentenced to three months' imprisonment on each of two charges of obtaining various sums of money from the Atlas Electrical Co., Ltd., by way of commission on electric lamp and supplies orders, some of which were stated to be forged.

Getting Rid of Smoke Nuisance.—Before Blackburn Magistrates, on June 27th, the case in which Messrs. Kershaw and Co., of Crystal Dye Works, were summoned for a black smoke nuisance, again came up. Mr. Bonney said that new apparatus had been installed, which had made a material reduction in black smoke. The firm had already spent £1,500 in motors and other machinery to remedy the nuisance. All the machinery would now be worked by electric current, and the boiler would be solely used for heating purposes. Mr. S. Mills (electrical engineer) said that when the new smoke-consuming apparatus was fully installed, he believed the smoke evil would be effectively overcome. The case was further adjourned.

Inquiries.—Makers of an electric cloth-cutting machine, and the holders of an electric process for fireproofing wood, are asked for. A correspondent wishes to get into touch with anyone who has successfully carried out the lighting of a Badminton court.

Plant for Sale.—The L.C.C. is inviting tenders for the purchase of two 3,500-KW. steam alternators, 6,600 volts, 25 periods. Particulars appear in an advertisement to-day.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. F. GOOCH, who has been for the past eight years in the Barrow-in-Furness Corporation electricity department, has resigned his position, to take up duties as engineer and manager to the Barton-on-Humber Electric Supply Co., Ltd., commencing from July 12th.

MR. WILLIAM TRAVIS has recently resigned his position as chief assistant engineer to the Hastings Corporation electricity department and joined the staff of the Brompton and Kensington Accessories Co., Ltd.

MR. ERNEST R. FERGUSON has been appointed a commercial assistant to the Corporation electric supply department, Birmingham. There were 60 applications.

The Redditch Urban District Council has appointed MR. R. N. MAYNE, deputy electrical engineer of the Erith Urban District Council electricity works, to be manager of the electricity undertaking.

MR. J. B. HOWAT, station engineer to the Southampton municipal electricity undertaking, has had his salary increased from £215 to £225 per annum. The maximum salary of the senior shift engineer (MR. HOOPER) has been fixed at £3 8s. per week, and the maximum of the shift engineers (MESSRS. AVENS and ALLEN), at £3 5s. per week.

The salary of MR. L. ROMERO, mains engineer to the Salford municipal electricity undertaking, is, subject to the usual sanction, to be advanced from £230 to £250 per annum, rising by biennial increments to a maximum of £300 per annum.

Tramway Officials.—The late tramways manager of Birkenhead, MR. W. WYLD, has received another present, this taking the form of a solid silver salver from the chief officials of the Corporation.

A Sydney newspaper says that MR. W. M. NELSON, engineer of the Christchurch (N.Z.) Tramways, has resigned that position, and he rejoins the Brisbane Co.'s service.

The Coventry T.C. has increased the salary of MR. T. R. WHITEHEAD, engineer and manager of the tramways, from £400 to £450 per annum, as from January 1st last.

The salary of MR. J. BULFIN, general manager of the Bournemouth tramways, has been raised to £700 (the maximum amount).

General.—We understand that MAJOR W. A. J. O'MEARA, C.M.G., late R.E., has now entirely severed his connection with the General Post Office, his appointment as "Engineering Special Commissioner" having terminated. At the Post Office Engineers' dinner in January last, the Postmaster-General announced that Major O'Meara had been called to the Bar, and intended to devote his attention to legal work. We believe, as a matter of fact, that he will be sharing chambers with an old friend of his—Mr. G. Phillips, of 2, Harcourt Buildings, Temple, W.C., who was Crown Prosecutor in Johannesburg during the military occupation in 1901, Major O'Meara being Mayor there at the time. As many of our readers will probably remember, the Major has filled many responsible offices in technical service, and he has accumulated a wide engineering experience, not only connected with telegraph and telephone matters, but in his younger days he was responsible for a great deal of work on the reconstruction of the Portsmouth and Cape Town defences. In that way he was brought closely into contact with civil engineering work, while he has also been employed on special duty in connection with the Service. We have no doubt that Major O'Meara's long and exceptional engineering and administrative experience, coupled to his legal knowledge, will prove a happy and very convenient combination, of which those interested in electrical and engineering undertakings will not be slow to avail themselves as occasion arises.

MR. E. M. LACEY has changed his offices to 12, Victoria Street, Westminster, S.W.

The Council of the Royal Society of Arts has awarded the Society's Silver Medal to the following readers of papers during the Session 1912-13:—DR. F. MOLLWO PERKIN, "Natural and Synthetic Rubber." MR. FRANK BAILEY, M.Inst.C.E., "Electric Supply in London." MR. F. G. OGILVIE, C.B., LL.D., "The Science Museum."

MR PAUL JOHN WEISS announces in the *Times* that henceforth he will be known by the surname of White. Mr. White is general manager of the London Electric Warehouse Co. (Brush Co.)

MESSRS. HEAP & DIGBY have removed to 48, Westminster Palace Gardens, Victoria Street, S.W.

MR. FRANCIS HUSBAND, A.M.I.E.E., has resigned his position with the London County Council tramways to take up the position of engineer and director with the Electrical Contracts and Maintenance Co., Ltd., Sanctuary House, Westminster, S.W., as from July 1st.

The Postmaster-General has appointed MR. V. M. DUNFORD to be Deputy-Controller of the Central Telegraph Office, and MR. J. BAILEY, MR. A. W. EDWARDS, and MR. A. TAPLEY to be assistant controllers.

The marriage took place at Bethel Church, Penygroes, on June 25th, of MR. RICHARD JONES O'BRIEN OWEN, electrical engineer, only son of the Rev. D. O'Brien Owen, of Carnarvon, and Miss Anne Williams.

The marriage took place at Cookham (Berks.), on June 19th, of MR. FRANCIS W. MAIN, A.M.I.E.E., to Miss Deborah Clara Buckham.

It is announced that the President of the Board of Trade has appointed Lieut.-Colonel P. G. VON DONOP, R.E., to be Chief Inspecting Officer of Railways, in succession to Lieut.-Colonel Sir Arthur Yorke, R.E., who has retired from that post under the age limit.

The *Times* states that SIR HENRY NORMAN has been elected a member of the British Association Committee of Radiotelegraphic Research, of which Sir Oliver Lodge is chairman.

MR. T. H. U. ALDRIDGE, municipal electrical engineer of Shanghai, is due in this country any day; indeed, he may have arrived before these lines appear in print. The Municipal Council has recently shown its high appreciation of Mr. Aldridge's services by advancing his salary, as from May 1st, from 11,760 taels to 13,200 taels per annum, figures equivalent to £1,560 and £1,780 respectively. It has also granted him an honorarium of £500 in recognition of the extra work involved in connection with the new Riverside power station just completed at Shanghai.

A local correspondent writes:—"MR. ARTHUR MURDOCH, who was formerly on the engineering staff of the Blackpool Corporation electricity works, and who is now the electricity and tramways engineer to the Melbourne City Tramways, is on holiday at Blackpool."

MR. A. S. E. ACKERMANN left England on 1st inst. for Egypt, for the purpose of testing and reporting upon the Shuman-Boys Sun power plant, which has been erected near Cairo. Lord Kitchener, who recently inspected this plant at work, expressed the view that it would be a great help to the development of the Sudan and Upper Egypt, and wished the promoters every success.

MR. F. C. PHILLIPS, who has for some time past represented Mr. C. M. Simpson, Bristol, in the South Wales and West of England area, has now severed his connection with this firm, having taken up the position of representative in these districts for Messrs. Friend, Windle and Co., electrical and general engineers and merchants, 8, Westgate Street, Cardiff.

A presentation of a silver rose bowl was made to MR. C. CROMPTON at the Arc Works Clubhouse on Friday last, the occasion being his retirement from the services of Messrs. Crompton & Co. Mr. A. J. Hodgson, the works manager, in making the presentation on behalf of the employés, referred to Mr. Crompton's long connection with the company, and Mr. Bickmore, as one of its oldest servants, spoke in support of Mr. Hodgson's expression of good wishes for Mr. Crompton's future success.

Obituary.—MR. T. E. BROWN.—We regret to record the death, after a long and painful illness, of Mr. Tom E. B. Brown, for many years joint managing director of Messrs. Ross, Courtney and Co., Ltd., of Ashbrook Road, Upper Holloway, London, N.

MR. JOSHUA SHAW, head of the firm of Messrs. John Shaw and Sons, Ltd., steam, hydraulic and electrical engineers, of Salford, died on Saturday, at the age of 73. He was formerly a member of the Salford Town Council, and served at one time as chairman of the Electricity Committee.

The death took place on June 26th, after a painful illness, of MR. ERNEST SYKES, A.M.I.E.E., of 7, King Cross Street, Halifax. The deceased was in his 41st year.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Buenos Ayres City and Suburban Tramways, Ltd.—Trust deed dated June 5th, 1913, to secure £500,000 first debs. at 5 per cent., charged on two concessions granted by the Provincial Government and Municipality of Buenos Ayres. Trustees: Dr. M. Lacroze, 4, Moorgate Street, E.C., and M. A. Edwards, 8, Old Jewry, E.C.

Electrical Engineering and Motor Co. (Carlisle), Ltd.—Particulars of £500 debentures, created June 14th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Alderley and Wilmslow Electric Supply Co., Ltd. (47,663). Return dated May 6th, 1913. Capital, £80,000 in £1 shares (10,000 pref.); 15,009 ord. shares taken up; £15,009 paid. Mortgages and charges: £15,000.

Montreal Tramways and Power Co., Ltd.—Particulars of $1,350,000 (£277,397 5s. 2d.) collateral gold notes, created February 13th, and secured by trust deed dated February 15th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: First mortgage 5 per cent. bonds of the Canadian Light and Power Co. of the aggregate par value of $1,800,000. Trustees: National Trust Co., Ltd., of Montreal, Canada.

Particulars of $5,000,000 (£1,027,327 5s. 2d.) collateral trust gold notes, created April 9th, andsecuredd by trust deed dated April 1st,1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: 60,000 shares of the 5 per cent. mortgage debenture stock of the Montreal Tramways Co., of Montreal, of the aggregate value of $6,000,000; 10,400 $100 shares of the capital stock of the said company; 39,000 $100 shares of the common capital stock of the Canadian Light and Power Co.; 875 $100 shares of the common capital stock of the Saraguay Electric and Water Co.; and 90 per cent. of the entire capital stock of the Dominion Light, Heat and Power Co. Trustees: Bankers' Trust Co., of New York.

Exchange Telegraph Co., Ltd.—A memorandum of satisfaction in full on June 20th, 1913, of charge dated January 14th, 1910, securing £5,000, has been filed.

South London Electric Supply Corporation, Ltd.—Issue on June 5th, of £1,200, and on June 17th, 1913, of £1,300 debentures, parts of a series of which particulars have already been filed.

T. W. Vaughan & Co., Ltd.—Debenture dated June 6th, 1913, to secure £3,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. C. Stark, Shoma, Malford Grove, Snaresbrook, Essex.

James Keith & Blackman Co., Ltd.—A memorandum of satisfaction in full on June 14th, 1913, of debentures dated July 2nd, 1907, securing £175, has been filed.

Electromobile Co., Ltd.—Issue on May 9th of £151 10s. and on June 9th, 1913, of £150 15s. debs., part of a series of which particulars have already been filed.

CITY NOTES.

R. Waygood & Co., Ltd.

MR. H. C. WALKER presided at the annual meeting held on June 27th, at Cannon Street Hotel, E.C. He said that at last year's meeting it was announced that they were just completing the erection of a new factory for electrical work. This had now been finished, and the majority of their machines had been rearranged and the factories reorganised. The trading profit was less than last year, partly in consequence of the disorganisation during building operations, and partly because of the rise in price of raw materials, and while they did not adversely criticise the Government insurance scheme, this accounted for an additional expenditure of £800 during the year under review, which was at the rate of £1,200 a year. The general charges were, however, proportionately less, and the figures were as follows:—Trading profit, £77,520; dividend on investments, £951; and on the other side, general charges, &c., £50,818; depreciation on plant, &c., £2,398, leaving a balance to be carried down of £25,261, or with the balance from last year, a total of £31,541; from this are deducted directors' fees, £2,800; dividend on preference shares, £8,100; amount added to reserve, according to Article 132, £1,500, leaving a balance of £19,141. They had already paid an interim dividend on the ordinary shares at the rate of 5 per cent. per annum, amounting to £3,375, leaving a balance available of £15,766. After referring to various lifts that had been installed by the company during the year, the chairman said that they had seen paragraphs in the Press relating to suggested arrangements with the Otis Elevator Co., of New York. He would say that negotiations did take place, and proposals were made to this company by the Otis Co., but the terms were not sufficiently attractive. The directors had been in no way responsible for the circulation of these reports, or for the dealings in shares which resulted. Further working capital was required, in order to meet the rapid development of the business, and they would at once issue the remaining shares, giving the shareholders the first opportunity of taking them up. The further dividend now recommended (9 per cent. per annum for six months) made the total dividend 7 per cent. for the year, and £9,691 was to be carried forward.

MR. E. P. OKEDEN seconded the adoption of the report, and it was carried.

Chas. Churchill & Co., Ltd.—The general activity in the engineering trades is reflected by the increased profits of this company. The company's net profits amounted to £35,400, which compares with £23,000 for the previous year, and the dividend on the ordinary shares is raised from 20 to 40 per cent. A sum of £12,000 is placed to reserve, as against £10,800 a year ago, and the balance carried forward is also higher at £4,200.—*Financial Times.*

General Electric Co., Ltd.—The report for the year ended March 31st, which reached us just as we go to press, shows that the net trading profits and income from investments, &c., amounted to £145,261, compared with £133,564 for the previous year. The dividend on the ordinary shares is to be 10 per cent. for the year, as compared with 7½ per cent. for the previous year. It will be remembered that there was an issue of £150,000 6 per cent. preference shares during the year. The meeting is to be held in London on July 10th.

Sao Paulo Tramway, Light and Power Co.—A dividend of 2½ per cent. on the Common stock is announced, payable August 1st.

British Continental Electricity Co., Ltd.

THE directors' report states that during the year ended April 30th 1913, 241 new installations were connected, while the number of lamps added during this period, calculated on the usual basis of 8-C.P. (carbon), has been 1,802 (motors calculated in equivalent lamps). After writing off £177 depreciation at the usual rates in respect of furniture, tools, meters, &c., and £219 depreciation of plant and stock, the balance standing to the credit of revenue account, after deducting the interim dividend paid on the 5½ per cent. cumulative preference shares for the half-year ended October 31st, 1912, and including the amount brought forward, is £1,584, out of which has been paid an interim dividend on the ordinary shares for the half-year ended October 31st, 1912, leaving a balance of £1,284. Out of this there is to be paid a final dividend at the rate of 5½ per cent. per annum on the 5½ per cent. cumulative preference shares for the half-year ended April 30th, 1913 (£275); a final dividend at the rate of 3 per cent. per annum, free of income-tax, on the ordinary shares for the half-year ended April 30th, 1913 (£150); to the reserve fund £400, leaving to be carried forward £459. During the year all arrears of dividend on the 5½ per cent. cumulative preference shares have been paid off, together with the interim dividend due to October 31st, 1912. Five per cent. debentures for £1,512 have been issued and subscribed for by the preference shareholders. £439 has been expended on capital account during the year.

Prospectuses.—*The Humphrey Pump Co., Ltd.*—The list was to close yesterday in an issue of shares in this company, which has been formed with a nominal capital of £200,000—£50,000 in 7 per cent. preference, and £150,000 in ordinary shares of £1 each. The purchase price is £125,000, £25,000 in preference, and £100,000 in ordinary shares, so that after paying preliminary expenses, the whole of the proceeds of the issue will be available for working capital and general purposes.

Georgia-Carolina Power Co.—This company is shortly to offer to the public $1,590,000 5 per cent. first mortgage bonds guaranteed unconditionally by the Augusta-Aiken Railway and Electric Corporation at the price of £90 per cent. with bonus.

Electrical Apparatus Co., Ltd.—The business, &c., of this company has been taken over by one of the same name from June 30th. Owing to continued expansion of business and in view of future extensions, the new company is making a public issue of shares (42,700 7 per cent. cumulative preference shares, £1 each) at par. The bulk, we understand, has been already applied for privately. The proceeds of the issue, if fully subscribed, will provide nearly £40,000 additional working capital. The prospectus will be found in our advertisement pages to-day. The last annual report of the old company, showing very successful trading, appeared in our issue of June 6th.

Japan.—The Kinugawa Hydraulic Electric Co. has declared a dividend of 7 per cent. for the last financial half-year and the Keihin Electric Tramway Co. one of 6 per cent.

Mexico Tramways Co.—The directors have declared a dividend of 1¾ per cent.

Mexican Light and Power Co.—The directors have declared a dividend of 1 per cent. on the ordinary shares.

Shawinigan Water and Power Co.—The directors have declared a dividend of 1½ per cent. on the common shares, being at the rate of 6 per cent. per annum, for the quarter ending June 30th.

Continental.—FRANCE.—A new company has lately been formed in Paris, with a capital of £80,000 and the title La Société de l'Electricité de Reims, to establish a central electric lighting station in the town of Rheims.

La Société Francaise de Matières Isolantes et d'Applications Electrique is the name of a new company which has just been formed at Puteaux (33, Rue Voltaire), near Paris, with a capital of £19,500.

GERMANY.—The report of the Gesellschaft Mix und Genest. Telephon und Telegraphenwerke, of Berlin, for the last financial year, shows a net profit of £7,816, as compared with £6,501 in the preceding 12 months. Owing, however, to the unfavourable position of several affiliated concerns, special depreciations have to be made, with the result that the accounts show a total loss of £60,118. In order to re-establish the business the directors have proposed to the shareholders to write down the capital of £350,000, by reducing the shares in the proportions of from 5 to 3.

Rio de Janeiro Tramway, Light and Power Co.—The directors announce a dividend of 1¼ per cent., payable August 1st.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors announce an interim dividend for the quarter ended March 31st of 2s. 6d. per share, tax free, payable on July 15th.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers, during the five weeks ended May 30th, 1913, amounted to 1,478,251, compared with 1,257,608 units in the corresponding five weeks of 1912.

Hobart Electric Tramway Co., Ltd.—A dividend of 1s. per share is announced, payable on July 1st.

Edmundsons' Electricity Corporation, Ltd.

THE directors' report for the year ended March 31st, 1913, states that the business of the company shows continued progress. Dividends and interest have increased by £3,488, whilst the loss on working the local authorities' undertakings is reduced by £2,029. On the other hand, administration expenses have increased by £1,145, whilst gross trading profit, owing principally to the smaller capital expenditure of the subsidiary companies, is reduced by £2,816. The net profit, after providing for interest on and redemption of debenture stocks amounts to £18,900. The directors paid in December last an interim half-yearly dividend at the rate of 6 per cent. per annum on the 6 per cent. cumulative preference shares, and they now recommend the payment of a further half-year's dividend, making up the full 6 per cent. dividend on these shares for the year ended March 31st last, and that the balance, £6,900, be carried to reserve. It is proposed that the 6 per cent. dividend on the cumulative preference shares should, in future, be paid half-yearly on January 15th and July 15th. The result of the scheme of capital reduction is shown in the balance-sheet. The ordinary share capital has been reduced by £160,000, and this amount, together with the reserve items of £136,716 and £95,705 appearing in last year's balance-sheet, has been applied in writing down the value of investments and in entirely writing off the item of goodwill. During the past year the Frome undertaking has been taken over by the company from the Frome Urban District Council.

From the schedule showing capital expenditure and gross profits of subsidiary and other companies for the years 1911 and 1912 we extract the following :—

Name.	Gross profit (before providing for capital charges and depreciation). 1912. £	1911. £	Lamps connected (equiv. 33-watt). 1912.	1911.
Alderley	2,842	2,274	24,898	22,866
Bromley	13,038	13 081	107,649	101,276
Folkestone	16,073	16,539	131,253	124,149
Guernsey..	5,539	3,483	112,950	106,078
Isle of Wight	14,171	13 986	115.455	115,987
Ilfracombe	1,234	1,293	19 936	18,627
Lymington	1,896	1,789	18 610	17,043
Melton Mowbray ..	2,519	2,282	21.965	21,063
Newmarket	2.559	2,421	27 810	27,139
North of Scotland ..	6,395	5,782	76,882	71,872
Ramsgate	5,619	2,676	37,519	34,648
Scarboro' trams. ..	377	804	—	—
Salisbury	6,346	6,015	41,621	39.569
Urban Co.	54,265	47,649	677,495	589,737
Wycombe	5,780	5,432	63,505	57,901
Cromer	1,100	899	15,805	14 271
Dorking	2,290	2,117	21,908	19,743
Frome	1,499	1,208	43,745	34,253
Hamilton	3,639	3 261	58,427	52,623
Surbiton	*4,687	*4,363	*42 518	*39,525
	£149,768	£137,354	1,669,952	1,508,170

* Figures for year ended March 31st.

Total capital expenditure, 1912, £3,001,669; 1911, £2,918,161.

The meeting is called for Thursday, July 10th.

Aron Electricity Meter, Ltd.

MR. H. HIRST (chairman) presided on Tuesday, at Winchester House, E.C., over the sixteenth ordinary general meeting of the above company.

In moving the adoption of the report (see ELECTRICAL REVIEW, Vol. 72, page 1078), the CHAIRMAN said the shareholders would no doubt share the satisfaction the board felt at the continued progress of the company. The year under review had not been one of continued sunshine, and many a black cloud had appeared in one or other of the territories in which they operated. The rise in the price of raw material, political troubles, and labour unrest, had all contributed to the anxiety of the board and management. Nevertheless, the result of the year's working was exceedingly pleasant, and their net profit of £32,652 was about £2,000 ahead of last year. This practically represented the exact amount of the increase in their gross profit, which was £53,000—a proof that the same careful and conservative principles had prevailed during the past year, which had helped them in the past in lifting the company from adverse conditions into a flourishing concern with every appearance of continued progress. As regarded the balance-sheet, the items were clear, and he could not think of any necessary comments except so far as the first item on the credit side was concerned, namely, £213,298. This item he noticed from correspondence and inquiries which came to him in the course of the year was looked upon by many shareholders as if it represented goodwill and patents only. The people who complained most about insufficiency of details in balance-sheets were generally the greatest sinners in the way of reading them. This item included such solid assets as valuable freehold land in Schweidnitz, Vienna and Paris, very important and expensive buildings, modern machinery and tools. The actual hard cash spent on additions to these items since the formation of the company amounted to a grand total of £120,000. He, personally, was of the opinion that the actual amount for goodwill and patents had been, by very generous depreciation on the one side and by reserves on the other, reduced to quite a normal and unimportant figure. He doubted very much, if their property were valued to-day by a conservative valuer, whether he could debit that account with more than £50,000 for goodwill and patents. Perhaps the board, for the satisfaction of the shareholders, would arrange in the coming year for such a valuation to be made. The only other comment of utility which he could make was with reference to the appropriation of the profits. The directors had decided to recommend a payment of a dividend on the ordinary shares of 7 per cent., or 1 per cent. more than last year. No doubt there were those among them who thought they ought to pay more. He wished to assure them that the directors had given the fullest consideration to this problem; the constant increase of business absorbed their finances to the full, and he might tell them that during the period which had elapsed since March 31st, to which date their accounts were made up, their sales had again gone up considerably, as compared with the same period of last year. Whilst the business increased, the profits did not show entirely in cash, but largely in additional outstandings and stock necessary to satisfy their customers. In addition to this, it must not be forgotten that the bulk of the business of the company was done in the Central European countries—Germany, Austria, France and Belgium. The war cloud which hung over Austria had not entirely disappeared, and whilst they had no fear of severe bad debts, they had to reckon with slower payments and increased outstandings. The present financial position in other European countries was so well known, that he was sure that if they gave that situation one minute's thought, they would agree with them that this was not a time when they should part too lightheartedly with such liquid assets as hard cash. The whole of the future welfare of the company might be seriously affected by so doing. He wished again to thank Dr. Aron and his staff for the skilful and able manner in which they had handled the business during the past year.

SIR JAMES PENDER, Bart., seconded the motion.

MR. ASHBY said it was impossible to be otherwise than satisfied with the report, and the chairman had anticipated him in regard to the point he had intended raising as to the amount of the dividend. It was obvious that the company was capable of paying more, which would increase the value of the shares, but he would have preferred to submit to the explanation of the chairman.

MR. FISHER, as one of the original subscribers, also expressed satisfaction at the report, but asked if the board could not approach the company's stockbrokers with the view of reducing the margin at which the shares were quoted.

The CHAIRMAN said he had nothing to add to what he had already said regarding the distribution of profits. They had made the profit, but the safety of the company was their first consideration. He thought it was the business of the board to look after the business, and not to concern themselves with the quotation of the shares.

MR. H. KAHN pointed out that the bulk of the shares were in the hands of those who, having seen the progress of the company, wished to hold them, and there were very few of the company's shares floating about on the market.

The report was adopted, and the retiring directors re-elected.

J. G. White & Co., Ltd.

THE annual meeting was held on June 26th at the Cannon Street Hotel, Lord Arthur Butler presiding.

The CHAIRMAN, in moving the adoption of the report (see ELEC. REV., Vol. 72, p. 1075), said that it showed that the company was maintaining its good record. The net profit for the year was £88,797, an increase of £1,691, and, with the exception of 1911, the year under review was the most successful in the company's history. After making substantial additions to the reserve accounts, the directors recommended dividends at the same rate as for the past two years. Turning to the assets side of the balance-sheet, it would be noted that the quick assets in the form of cash, loans at call, and short time loans against securities, showed little change from last year's figures, the amount of this form of asset being still nearly equal to the whole share capital of the company. Investments now stood at £163,728, about £32,000 less than last year, which was due to the sale of certain of their securities, and at a substantial profit. The investment account included the securities of various tramway, lighting and other public utility companies in which they were interested, and also the shares of several allied or subsidiary companies, the most important of which was the Municipal and General Securities Co., which was doing an increasing and successful financial business and had paid dividends of 10 per cent. on its capital, after making liberal allocations to reserves. The business of that company had so much increased that since the date of the balance-sheet its capital had been further increased by £50,000, all of which was subscribed by this company. The Building Construction Co., in which the company was interested, had during the year been placed in voluntary liquidation, as it was considered that the present conditions of the building trade were such that satisfactory profits were not likely to be earned. The result of the liquidation, however, would be the repayment to the company as a shareholder of an amount in excess of the cost and the balance-sheet value of the shares held. In the opinion of the directors, the investments had been conservatively valued, and the interest and dividend return received upon them was at a higher rate than last year. The items of sundry debtors and works in progress, together amounted to £229,018, an increase of nearly £157,000 over last year. This indicated a considerable amount of new business which the company had secured during the past year, and they had at present more contracting, operating and engineering works in hand than for some time past. A considerable part of this increased figure was, however, due to the interest they had taken in the formation of the International Light and Power Co., Ltd., a company which was interested in tramways, lighting and power undertakings in

South America and elsewhere. The items of plant and purchase of business remained as before at the nominal valuation of £1 each. Turning to the debit side of the balance-sheet, there was no item requiring explanation other than that of sundry creditors, now standing at £141,206. This was also larger than last year, and, like the debtor item on the other side, was an indication of the increased business they were at present doing. The balance of profit available for allocation was £89,904, which was £6,691 more than the amount they had to deal with last year. With the balance brought in from last account they had £110,009 to deal with, out of which the interim dividend of £12,000 had been paid, and the percentage to staff and directors who were members of the staff in accordance with agreements, amounting to £8,105, leaving a balance of £89,904 now available. In the distribution of profits they recommended: (1) The setting aside of £20,000 to be added to the general reserve account, bringing it up to £120,000; (2) £10,000 to be added to the reserve for equalisation of dividends, making this account £50,000, or a sum greater than the 12 per cent. dividend on both classes of shares for two years. Over one-third of the profit earned in the year was thus retained in the various reserve accounts, and should enable them further to increase and develop the company's business. The remaining profit permitted them to recommend the payment of a dividend (after taking into account the interim dividend paid in January last) of 12 per cent. on the preferred shares and also 12 per cent. on the ordinary shares, and a further extra dividend of 10s. per share, or in all 62 per cent. on the ordinary shares. The amount carried forward would be increased from £21,212 to £22,904. The total of the reserve accounts and unallocated profits carried forward would amount to £192,904, or almost equal to the total share capital. As he had already told them, they had more good business in hand than last year, and the outlook appeared to them to be favourable, although the financial stringency at the present time would undoubtedly have its effect on new enterprises during the latter half of this year, and might delay their progress and defer the realisation of profits which they would ultimately earn. They could not expect in every year to be able to pay as large dividends on the ordinary shares as on this occasion, but he could say that the outlook was at present satisfactory, and they hoped that the company would continue to increase its business, strengthen its position and maintain a satisfactory rate of return to the shareholders.

MR. W. C. BURTON seconded the resolution, and the report was adopted without discussion.

Bombay Electric Supply and Tramways Co., Ltd.

THE annual meeting took place on Tuesday last week at Kingsway, when Sir Charles Ollivant, K.C.I.E., presided.

In presenting to the shareholders the directors' annual report (see ELECTRICAL REVIEW, Vol. 72, p. 994), the CHAIRMAN said that 1912 had been a gratifying year. In perusing the accounts they would observe with satisfaction that while the total revenue for the year increased by £17,394, the advance in earnings was obtained by an increased expenditure of only £2,292. The net revenue amounted to £128,682, as against £113,580 for 1911, or an increase of £15,102, which was equivalent to 13·28 per cent. The directors proposed to allocate £30,000 for payment of a dividend (free of English income-tax) at the rate of 5 per cent. per annum (as against 3 per cent. last year) to the holders of the company's ordinary shares, and to carry forward £5,072 to the next account, the dividend to be paid simultaneously in London and Bombay on July 1st. The directors had considered it proper to increase by a sum of £5,300 the provision for depreciation, the advance being mainly called for by the additional plant installed in the course of 1911 at their new Kussara power house, and by the considerable extensions made last year to their supply mains. The past year's good results were achieved in competition with a year when both the traction and supply branches of their business obtained special accretions of revenue from the Royal visit to Bombay. As was pointed out last year, that auspicious event led to a very large influx of visitors into the city during the last three months of 1911, resulting in record traffics on the tramway, while the public illuminations and fêtes brought considerable additional revenue to the electrical supply department. It was all the more satisfactory, therefore, that their electric supply branch should during 1912 have shown such substantial progress. In 1912 they delivered to consumers (exclusive of supply to the tramways) 4,364,977 units as against 3,356,184 units in 1911, or an increase of 30 per cent. The gross revenue of the branch showed an increase of £14,883, whilst the working expenses showed a decline of £2,581. The reduction in their generating costs was mainly due to the economies effected by the greater efficiency of the new power station. Therefore there seemed every reason to anticipate that, unless they were handicapped by an increase in the price of coal, their generating costs would be still further reduced as their load expanded. With regard to the traction branch, it was somewhat disappointing that he could not refer to equally encouraging returns. As they would have seen from the report, the profit, as compared with 1911, showed a small decrease of £1,254. While the gross traffic receipts increased by £3,206, the advance in working expenses more than absorbed this. The increase in expenditure was mainly occasioned by the thorough overhaul of their rolling stock last year. While they had been able progressively to extend their mains they had been unable to make any extensions of their tramway lines for five years. Several new streets were now approaching completion, and the laying of tramway lines in some of them would certainly prove an advantage to the city, which would no doubt be undertaken by the company, subject to their obtaining the consent of the Corporation to such a scale of fares as would reasonably justify the company in incurring the necessary outlay. With regard to their investments belonging to the depreciation and sinking funds, they were as usual taken in the balance-sheet at cost price. Consequent upon the acute depression which had ruled for some time past on the Stock Exchange, there had been in the case of some of the shares a slight decline in value, but as their investments had been carefully selected he felt sure their value would increase as soon as a healthier tone pervaded the Stock Markets. He moved the adoption of the report.

MR. F. W. CHANTER seconded, and the motion was carried *nem. con.*

MR. E. GARCKE proposed the re-election of Sir Chas. Ollivant and Sir Walter Hughes as directors. This was seconded, and carried unanimously.

Globe Telegraph and Trust Co., Ltd.

THE annual meeting took place on Tuesday last week at the offices, Electra House, E.C., under the presidency of Sir J. Wolfe Barry, K.C.B. (chairman).

The CHAIRMAN said that there had been some change since their last meeting, but that must be expected in a trust company such as that, as they were dependent practically upon the income from the various concerns in which their capital was invested. Taking the net result, they had not had an unsatisfactory year; while there had been losses, there had been gains as well. The net receipts, after deducting working expenses, amounted to £209,828, which was a slight decrease over the preceding year, but with the balance of £27,997 brought forward as shown by the balance-sheet there remained a total of £237,825. They had paid their usual quarterly dividends, which absorbed a sum of £131,085. The directors now recommended the payment of a dividend of 3s. per share, less income-tax, on the preference shares, making with previous distributions a total dividend for the year on those shares of 6 per cent. per annum, and 6s. per share net on the ordinary shares, making, with previous distributions, a total dividend on those shares of 6 per cent. net. Those dividends would absorb the sum of £79,922, leaving a balance of £26,817 to be carried forward to the next account. Their list of investments they would find had been altered somewhat. First, £4,500 of the Anglo-American Telegraph Co.'s preferred stock had been sold and 15 of the certificates of the Submarine Cable Trust had been drawn for payment at £120 per certificate, and the money had been re-invested. There had been a slight reduction from the Anglo-American Co.'s stock which was caused by a dividend of 6 per cent. being guaranteed by the Western Union Co. which took them over. There had been also a decrease in the yield of the United States Direct Telegraph Co., which was caused through a slight decrease in their dividend occasioned by an extra expenditure on cables. They had, however, sold some of the shares and re-invested the money at a higher rate of interest, which would also account for the difference in the returns. They had also had gains, one being an increased dividend from the Great Northern Telegraph Co.'s stock, and another from the Mackay Co.'s. The Telegraph Construction and Maintenance Co. had also declared a larger dividend, which meant an additional £1,000 to them; 150 extra shares had been bought in that company, which brought in an extra £300. He had pleasure in reporting a slight decrease in their working expenses this year, and their investments showed a present market value of something like £200,000 over cost price.

SIR JAMES PENDER seconded the adoption of the report, and Sir John Wolfe Barry was re-elected chairman.

Chilian Electric Tramway and Light Co., Ltd.

THE fifteenth ordinary general meeting of this company was held on Thursday last week at the offices, London Wall Buildings, E.C., Mr. Ludwig Breitmeyer in the chair.

The CHAIRMAN, in proposing the adoption of the report, said that the credit balance of the year—£163,542—again compared most favourably with that of the previous year, which amounted to £135,978. In consequence, they were able to place £60,000 to the renewals reserve account and £7,000 to insurance suspense account, and sufficient funds were left to declare a dividend of 6 per cent. for the year 1912 on the preference shares, amounting to £39,000, and, further, to pay the full arrears of dividend of 6 per cent. for the year 1901, and 5 per cent. for the year 1902, amounting together to £60,500. After making those provisions they carried forward a balance of £8,381. The outstanding balance of cumulative dividends still in arrear on the preference shares had now been reduced to £202,500, and he looked forward to seeing that sum finally wiped out at an early date. Again, for the year they had the pleasure of submitting record figures for both tramway traffic and light and power receipts. In the year under review 102,677,482 passengers were carried, which was an increase of 10 millions over the previous year, which in itself was a record; while the receipts showed an advance of 1 million pesos. Owing however, to the increased expenditure in higher wages and the very low tariff which they were bound to maintain by the terms of their concession, the profit on the tramway undertaking was, in the opinion of the directors, hardly an adequate return on the very large capital invested. The question of the tariff was receiving the very earnest

attention of the board, and no opportunity would be neglected of endeavouring to get a modification of the concession from the municipality. The receipts from the lighting and power department amounted to 6½ million pesos, against 5½ millions in 1911, which gave satisfactory evidence of the great development of that branch of the business. The increase in the consumption, both of light and power, by the inhabitants of Santiago was a very gratifying feature of their industry, and he looked with confidence to still further expansion, and to that end they were making important additions and alterations to their existing installations.

MR. V. RIBTON TURNER seconded the motion, and the report was adopted.

STOCKS AND SHARES.

Tuesday Evening.

THE turn of the half-year has brought a slight amount of relief to the Stock Exchange so far as the monetary stringency is concerned, and the crisis of the past few weeks, financial and political, was regarded as happily over. Then the quarrels between Bulgaria, Servia and the rest, came to upset prices again. Members have got so used to the idea of these Balkan States being at one another's throats, that they are content, however, to pay less heed to what developments there may be, and prices are much better in the markets now than was the case a fortnight ago.

One striking example of the change which has come over things, is to be seen in the way in which purely investment stocks and shares have responded to the altered conditions. Hundreds of securities were marked *ex* dividend in the Stock Exchange last Friday and to-day (Tuesday), and in a great number of cases the deductions have been partially recovered. This may be seen in some of the quotations given in our own lists. Stock Exchange dealers report that there is a demand for stocks and shares, where a little while ago only sellers obtained. It is worth noticing that the electric light share market shows a number of rises of about ½ in extent, a clear indication of the way in which the investor is on the look-out for cheap stock.

Most of these improvements are due to the market realising that there were very few cheap shares about, and that for these there is noticeable inquiry. In consequence, jobbers have put up the prices, and it is doubtful whether buyers of substantial amounts would be able to fill their orders even at the present quotations. Rises of ½ have occurred in Metropolitan Preference, Westminster Ordinary and Preference, London Preference, and County Ordinary. City "Lights" regained last week's loss of 10s. St. James advanced 5s., and so did Charing Cross shares. The market is distinctly a good one.

A feature of the past few days has been a fresh rise in the price of Marconi shares. This was started by the bears covering, upon the announcement that the company had concluded an important contract for the Norwegian Government, which contract, by the way, has this week been ratified in the Norwegian Parliament. In addition to this, however, expectations are current that the company will be able to cancel its present contract with the British Government, and to substitute a fresh one, which shall be—according to rumour—on terms more advantageous to the company than the present one. A third bullish factor is the hope of a good dividend, as to which doubts should be set at rest before these notes appear. The estimates, as we stated before, range from anything up to 20 per cent. With the price of the parent shares, there has improved the Preference quotation as well. Americans are *ex* the dividend, equal to about 4¾d. per share, and the price is steady at about 16s. 3d. Canadians have scarcely moved from their previous level of 10s. 3d. The market is once more active, and, at the time of writing, fairly buoyant, though how long this is going to remain so only a tipster would care to prophesy.

Another stock around which there has been increased speculation is National Telephone Deferred, the price jumping up to 25¼ a day or two ago. Something ought to be known this week as to the amount which holders of the Deferred residue are likely to get in virtue of the Government purchase price. Reuters remain dull, a fall of 5s. carrying back the price to 9¾ middle. Reuter's Bank, Ltd., was registered last week with an authorised capital of a million pounds in shares of £10 each.

The Telegraph market is steady, with improvements in Anglo-American Preferred and Direct United States Cable shares. West India and Panama first Preference fell back to 9¾, so that both classes of Preference shares are standing at the same level. Dividend deductions from the Debenture stocks in this department were partially recovered in various cases. The Telegraph manufacturing shares are very steady.

The feature in the Latin-Canadian group is a substantial recovery in British Columbia Electric Railway stocks. Released from the pressure to sell which depressed prices badly last week, the Deferred stock has rebounded 5 points, and the Preferred 2, while the 5 per cent. Preference rose 1½. In the cases of the first two, the gains have not wiped out the entire loss of the previous week, although they have gone some way towards it. The company's 4½ per cent. Debenture stock rose 1½.

Mexican securities are still somewhat out of favour. The Tramway shares are down 3, though the company's 5 per cent. first mortgage bonds are 1 up. Rio Tramway Bonds are harder. Brazilian Tractions, moving pretty actively, have been down to 87½ and up to 90½, closing this evening at 87½, with a fall of 2½ on the week. The Anglo-Argentine descriptions are mostly *ex* dividend, with the deductions partially recovered. Victoria Falls Preference shares have given way in connection with further weakness in the Kaffir market, induced by the extension of a strike on the Rand. The price is now *ex* the dividend of 1s. 2⅜d.

In the Manufacturing group, the quotation *ex* dividend of Brush Second Debentures serves to direct attention to the remarkably high yield which the stock pays at its present price, a return which, of course, is in itself in the nature of a cautionary signal. The Prior Lien Debenture is also *ex* dividend, and the yield works out to 6⅝ per cent. on the money at the present price. Cromptons are now quoted 0-¼, some of the shareholders not liking the idea of reorganisation, but the Debenture stock retains its rise of last week. Babcocks & Willcox at 3 have recovered their slight loss. The Rubber market showed pronounced strength upon the scrambling in of the bear brigade after the Stock Exchange settlement had served to reveal the extent of the "short" account. Most of the rise has been held. This week's auctions were noticeable for the comparatively small amount put up for sale, this being due to the fact that a large quantity did not arrive in time for it to be listed in the present catalogue.

MARKET QUOTATIONS.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, July 2nd.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or .
a Acid, Hydrochloric .. .. per cwt.	5/-	..
a " Nitric .. .. .. "	22/-	..
a " Oxalic .. .. .. per lb.	2⅜d.	..
a " Sulphuric .. .. .. per cwt.	5/6	..
a Ammoniac Sal .. .. .. "	42/-	..
a Ammonia, Muriate (large crystal) per ton	£29 10	..
a Bleaching powder .. .. .. "	£6 5	..
a Bisulphide of Carbon .. .. "	£18	..
a Borax .. .. "	£17 10	..
a Copper Sulphate .. .. .. "	£22 10	..
a Lead, Nitrate .. .. .. "	£27 10	..
a " White Sugar .. .. "	£26	..
a " Peroxide .. .. .. "	£32	..
a Methylated Spirit .. .. .. per gal.	2/6	..
a Potassium, Bichromate, in casks per lb.	3¾d.	..
a Potash, Caustic (88/90 %) .. per ton	£22 10	..
a " Chlorate .. .. .. per lb.	3¾d.	..
a " Perchlorate .. .. "	4½d.	..
a Potassium, Cyanide (98/100 %) .. " (for mining purposes only)	7½d.	..
a Shellac .. .. per cwt.	85/-	..
a Sulphate of Magnesia .. .. per ton	£4 10	..
a Sulphur, Sublimed Flowers .. "	£8 10	£2 inc.
a " Recovered .. .. "	£5 10	..
a " Lump .. .. .. "	£5	..
a Soda, Caustic (white 70/72 %) .. "	£10 5	..
a " Chlorate .. .. .. per lb.	3¾d.	..
a " Crystals .. .. .. per ton	£3 5	..
a Sodium Bichromate, casks .. per lb.	3d.	..
METALS, &c.		
b Aluminium Ingots, in ton lots .. per ton	£95	..
b " Wire, in ton lots (1 to 14 S.W.G.) "	£151 6 8	..
b " Sheet, in ton lots .. "	£126	..
p Babbitt's metal ingots .. .. "	£50 to £221	..
c Brass (rolled metal 2" to 12" basis) per lb.	8⅜d.	⅛d. inc.
c " Tube (brazed) .. .. "	9⅛d.	⅛d. dec.
c " " (solid drawn) .. "	8⅜d.	⅛d. dec.
c " Wire, basis .. .. .. "	8⅛d.	⅛d. dec.
c Copper Tubes (brazed) .. .. "	11½d.	⅛d. dec.
c " " (solid drawn) .. "	10⅝d.	⅛d. dec.
g " Bars (best selected) .. per ton	£80	£2 dec.
g " Sheet .. .. .. "	£80	£2 dec.
g " Rod .. .. "	£80	£2 dec.
d " (Electrolytic) Bars .. "	£69	£1 dec.
d " " Sheets .. "	£86	£1 dec.
d " " Rods .. "	£74 15	10/- dec.
d " " H.C. Wire per lb.	9½d.	..
f Ebonite Rod .. .. "	4/6	..
f " Sheet .. .. "	4/-	..
n German Silver Wire .. .. "	1/10	..
h Gutta-percha, fine .. .. .. "	7/- to 8/-	..
h India-rubber, Para fine .. .. "	3/10	1d. inc.
l Iron Pig (Cleveland warrants) .. per ton	56/3	11d. inc.
l " Wire, galv. No. 8, P.O. qual. "	£14	..
g Lead, English Pig .. .. .. "	£19 15	£1 5s. dec
m Manganin Wire No. 28 .. .. per lb.	6/6	..
g Mercury .. .. per bot.	£7 10	..
c Mica (in original cases) small .. per lb.	6d. to 8s.	..
c " " " medium "	8/6 to 6/-	..
c " " " large .. "	7/6 to 11/-	..
o Nickel, sheet, wire, &c. .. .. "	3/6 to 4/6 nom.	..
p Phosphor Bronze, plain castings "	1/1 to 1/3½	..
p " " rolled bars & rods "	1/0½ to 1/2	..
p " " rolled strip & sheet "	1/2½ to 1/5½	..
o Platinum .. .. per oz.	185/-	..
d Silicium Bronze Wire .. .. per lb.	9d. to 10½d.	dec.
r Steel, Magnet, in bars .. .. per ton	£55	..
g Tin, Block (English) .. .. "	£195 to £196	£13 dec.
n " Wire, Nos. 1 to 16 .. .. per lb.	2/7	..
p White Anti-friction Metals .. per ton	£50 to £228	..
k Zinc, Sh's (Vieille Montagne bnd.) "	£25	£2 5 dec.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations July 1st.	Rise + or Fall —	Present Yield p.c. £ s. d.
	*					
Bournemouth & Poole, Ord. ..	10	5½	6	9¼ — 10¼	..	5 17 1
Do. 4½ % Pref.	10	4½	4½	8⅞ — 9⅜	..	4 12 4
Do. Second 6 % Pref. ..	10	6	6	10⅛ — 10⅝	..	5 12 11
Do. 4½ % Deb. Stock	Stock	4½	4½	94 — 96 xd	..	4 13 9
Brompton & Kensington, Ord...	5	10	10	8⅜ — 9½	..	5 9 7
Do. 7 % Cum. Pref.	5	7	7	8¼ — 8½	..	4 0 0
Central Electric Supply, 4 % Guar. Deb.	100	4	4	94 — 97	..	4 2 6
Charing Cross, West End & City	5	5	5†	4⅛ — 4⅜	+ ⅛	5 5 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	+ ⅛	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4 xd	+ ⅛	5 12 6
Do. Do. 4 % Deb... ..	100	4	4	90 — 92	..	4 7 0
Chelsea, Ord.	5	5	4†	4⅜ — 5⅛	..	4 15 8
Do. 4½ % Deb.	Stock	4½	4½	94 — 97 xd	..	4 12 9
City of London, Ord.	10	8	9	15 — 16½	+ ⅛	5 9 1
Do. 6 % Cum. Pref.	10	6	6	12 — 12	+ ⅛	4 12 4
Do. 5 % Deb.	Stock	5	5	113⅛ —117⅛ xd	..	4 5 1
Do. 4½ % Second Deb. ..	100	4½	4½	98 —100 xd	..	4 10 0
County of London, Ord... ..	10	6	6	10⅛ — 11	+ ⅛	5 9 1
Do. 6 % Pref.	10	6	6	11⅛ — 11⅜	..	5 5 2
Do. 4½ % Deb.	Stock	4½	4½	102 —104 xd	..	4 6 7
Do. 4½ % Second Deb. ..	Stock	4½	4½	98 —101	..	4 9 1
Edmundson's, Ord.	£3	Nil	..	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	Nil	3	4⅛ — 4½	..	3 6 8
Do. 6% Non-Cum. Pref. ..	5	..	..	1⅜ — 2⅝	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	83 — 86	..	5 4 8
Folkestone	5	6	6	4½ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4½ — 5	..	5 0 0
Do. 4½ % First Deb.	100	4½	4½	90 — 92	..	4 17 10
Hove	5	9	9†	7½ — 7⅞	..	5 16 2
Kensington & Knightsbridge, Ord	5	9	8†	7¼ — 7⅜	..	5 16 3
Do. 4 % Deb.	Stock	4	4	90 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	76 — 80	..	5 12 6
London Electric, Ord.	8	2½	2½	1⅛ — 1⅜	..	4 7 9
Do. 6 % Pref.	5	6	6	4⅜ — 5⅛	+ ⅛	5 18 3
Do. 4 % First Mort. Deb. ..	Stock	4	4	88 — 91	..	4 8 0
Metropolitan	5	4	4†	3½ — 3⅝	..	5 10 4
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜ xd	+ ⅛	4 17 4
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	96 — 99 xd	..	4 10 1
Do. 3½ % Mort. Deb.	Stock	3½	3½	73½ — 81½ xd	..	4 6 0
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101	..	4 19 0
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9½ — 10½ xd	..	5 14 3
Oxford	5	7½	6†	5⅞ — 6⅜	..	5 13 9
St. James' and Pall Mall, Ord.	5	10	10†	8½ — 9	+ ⅛	5 11 1
Do. 7 % Pref.	5	7	7	6⅜ — 7⅛	+ ⅛	4 18 3
Do. 3½ % Deb.	100	3½	3½	82½ — 85½ xd	..	4 1 10
South London, Ord.	4	6	6	2⅜ — 3½	..	7 7 8
Do. 5 % First Mort. Deb. ..	100	5	5	96 — 99 xd	..	5 1 0
South Metropolitan, 7 % Pref...	1	7	7	1⅛ — 1⅛	..	5 17 11
Do. 4½ % First Deb. Stock ..	100	4½	4½	96 — 99	..	4 10 6
Urban, Ord...	£3	Nil	..	⅛ — ⅜	..	..
Do. 5 % Cum. Pref.	5	2	†	2⅜ — 2⅞	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	84 — 87	..	5 3 6
Westminster, Ord.	5	10	10	7¼ — 8⅜	+ ⅛	5 17 8
Do. 4½ % Cum. Pref.	5	4½	4½	4⅞ — 5⅛ xd	+ ⅛	4 7 10

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5 — 5½	..	5 14 3
Calcutta, Ord.	5	8½	8½	6⅞ — 7⅜	..	5 15 3
Do. 5 % Pref.	5	5	5	4⅛ — 5⅛	..	4 16 5
Calgary Power, 1st Mort. Bds.	100	5	5	91 — 93 xd	..	5 7 6
Canadian Gen. El. Com. ..	$100	7	7	108 —112 xd	+ 3½	6 5 0
Do. 7 % Pref.	$100	7	7	118 —123	..	5 13 10
Cordoba Lt., Power and T., Ord.	1	3	5	⅜ — ⅝	..	6 8 1
Do. 5 % Deb.	100	5	5	†3½ — 95⅛	..	5 4 9
Elec. Lt. and P. of Cochabamba, 7 % Bonds	100	6	6	90 — 92 xd	..	6 10 5
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	87½ — 90½	..	5 10 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	92 — 94	— ½	5 6 5
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/32 — 3/32	..	Nil
Do. 6 % Pref.	1	6	6	1/16 — 1/8	..	9 12 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	99 —101 xd	+1	4 19 0
Madras, Ord.	£	Nil	..	1½ — 1⅝	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	102 —105 xd	..	4 15 3
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	76½ — 79½ xd	..	6 5 9
Mexican Lt. & Power, Common	$100	4	4†	67 — 70	..	5 14 4
Do. 7 % Cum. Pref.	$100	7	7	96 —100	..	7 0 0
Do. 5 % 1st Mort. Gold Bds.	..	5	5	87 — 90	..	5 11 1
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	78 — 81	..	6 3 5
Montreal, Lt., H. and Power ..	$100	8	9†	210 —220	..	4 1 10
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	15 — 25	..	..
River Plate, Ord.	Stock	10	10	207 —217	..	4 8 0
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	102 —107	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	97½ — 99½ xd	..	4 19 6
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital ..	$100	5	£⅛	126 —130	..	4 0 9
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	104½ —106½ xd	..	4 14 0
Do. 4½ % Per. Deb.	Stock	4½	4½	98 —100	..	4 10 0
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	97 —100	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	90½ — 92½ xd	..	5 8 1
Victoria Falls Power, Pref. ..	1	11⅞d.	17⅜d.	11/16 — 12/16 xd	— 1/16	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106 —108	..	5 11

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	4½†	6⅞ — 7⅜	..	6 2 0
Do. 6 % Deb. Red.	Stock	5	5	93½ — 96½ xd	..	5 4 9
American Telep. & Teleg., Cap.	$100	8	8	129 —132 xd	..	6 1 3
Do. Collat. Trust	$1000	4	4	89 — 91 xd	..	4 8 0
Anglo-American Telegraph ..	Stock	8	8	61 — 64	..	4 13 9
Do. 6 % Pref.	Do.	6	6	108½ —109½	..	5 9 10
Do. Def.	Do.	80/-	80/-	28½ — 29½	..	6 6 4
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	104 —106	..	4 15 3
Chili Telephone	5	7	8	7⅞ — 7⅞	..	5 1 1
Commercial Cable, Stlg. 6% Deb.	Stock	4	4	83 — 85 xd	..	4 13 7
Cuba Telegraph	10	6	6	8½ — 9½	..	6 6 4
Do. 10 % Pref.	10	10	10	15½ — 16½	..	5 19 4
Direct Spanish Telegraph, Ord.	5	4	4†	8¼ — 8⅝	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	6¾ — 7½	..	6 12 0
Direct United States Cable ..	10	5	4	6 — 6½	..	6 3 1
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100 xd	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	123 —131	..	5 6 10
Do. 3½ % Pref. Stock.. ..	Do.	3½	3½	74 — 76	..	4 12 1
Do. 4 % Mort. Deb.	Do.	4	4	90½ — 92½	..	4 8 5
Eastern Extension	10	7	7	12⅞ — 13	..	5 7 8
Do. 4 % Deb.	Stock	4	4	91 — 93	—1	4 6 0
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	93½ —100½	..	3 11 7
Globe Telegraph and Trust ..	10	6	6†	10⅞ — 11½ xd	..	5 7 7
Do. 6 % Pref.	10	6	6	12½ — 12⅝ xd	..	4 15 1
Great Northern Telegraph ..	10	18	20	30 — 32 xd	+ ½	6 5 0
Indo-European Telegraph ..	25	13	13	55 — 57	..	5 14 0
Mackay Companies Common ..	$100	5	5	80 — 83	..	6 0 6
Do. 4 % Cum. Pref.	$100	4	4	67 — 70	..	5 14 4
Marconi's Wireless Telegraph	1	20	..	3⅛ — 3⅜	+ 1/16	5 5 0
Do. 7 % Cum. Partic. Pref.	1	17	..	3 — 3¼	+ ⅛	5 4 7
Monte Video Telephone, Ord. ..	1	6	6†	1 — 1⅛	..	5 6 8
Do. 5 % Pref.	1	5	5	⅞ — 1	..	5 14 3
New York Telep., 4½% Gen. Bnds.	100	4½	4½	97 — 98	..	4 11 10
Oriental Telep. and Elec. ..	1	8	10	1⅛ — 1⅛	..	5 10 2
Do. 6 % Cum. Pref.	1	6	6	1⅜ — 1½	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	87 — 89 xd	..	4 10 0
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	95 — 97 xd	..	4 2 6
Reuter's	10	10	10	9½ — 10½	— ½	9 15 2
Submarine Cables Trust ..	Cert.	6	6	124 —127	..	4 14 6
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	94½ — 96½ xd	..	4 13 3
United River Plate Telephone	5	8	8†	6¾ — 7	..	5 14 4
Do. 5 % Cum. Pref.	5	5	5	5 — 5⅛ xd	..	4 11 0
West Coast of America	2½	2½	..	1⅞ — 1⅞	..	4 3 4
Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4	4	93 — 96 xd	—1	4 1 8
West India and Panama Teleg.	10	1½	1½	2⅛ — 2⅜	..	4 10 11
Do. 6 % Cum. 1st Pref. ..	10	6	6	9½ — 10	— ⅛	6 0 0
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9½ — 10	..	6 0 0
Do. 5 % Debs.	100	5	5	99 —101 xd	..	4 19 0
Western Telegraph, Ltd. ..	10	7	7†	12⅜ — 13½ xd	..	5 5 8
Do. 4 % Deb.	Stock	4	4	90½ — 92½	..	4 6 6
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	90 — 93	..	4 16 9

* Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. 8s. in Funded Dividend Certs.

CONTINUED ON NEXT PAGE.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations July 1st.	Rise + or Fall —	Present Yield p.c. £ s. d.
	*					
Bath Trams, Pref. Ord.	1	Nil	Nil	3/16 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	3 3/32 — 3 5/32 xd	..	6 8 0
Do. 4½ % Deb.	100	4½	4½	92 — 97	..	5 17 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	9½ — 11¼	..	..
Do. Do. Deferred	100	..	..	4¼ — 6½ xd	— ½	..
Do. Do. 5 % Cum. Pr'f	100	5	5	79 — 82 xd	..	7 6 4
Do. 7 % Non-Cum. Pr'f.	100	..	3	39 — 42 xd	..	7 2 10
Do. 5 % Perp. Deb.	100	‡	5	89 — 93	..	5 7 6
Do. 4½ % 2nd Deb.	100	4½	4½	73 — 77	..	5 17 0
Central London Railway, Ord.	100	8	8	77 — 79	+2	‡5 1 3
Do. Pref.	100	4	4	80 — 82	..	‡4 17 7
Do. Def.	100	2	2	76 — 78	..	‡5 2 7
Do. 4 % Deb.	100	4	4	99 —101	..	3 19 8
City & S. London, 5 % Pref., 1891	100	5	5	101 —103	..	4 17 1
Do. Do. 1898	100	5	5	100 —109	..	4 18 0
Do. Do. 1901	100	5	5	99 —102	..	4 18 0
Do. Do. 1908	100	5	5	99 —102	+2	4 18 0
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Great Northern & City, Pr'f. Ord	10	Nil	Nil	1 3/32 — 2 3/32	..	Nil
Hastings Trams, 6 % Pref.	1	6	6†	3/32 — 5/32	..	7 13 7
Do. 4½ % Deb.	100	4½	4½	63 — 73	..	6 8 3
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2½ — 2¾	..	4 15 3
Do. 4 % Deb.	100	4	4	73 — 78 xd	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	76 — 78 xd	..	6 8 2
London and Suburban, Ord.	1	..	..	1/32 — 3/32	..	..
Do. Do. 5 % Cum. Pref.	1	..	..	1/32 — 3/32	..	..
Do. Do. 4½ % 1st. Deb.	100	..	4½	73 — 78 xd	..	5 12 6
London Elec. Railw'ys, 4 % Deb.	100		4	91 — 93 xd	..	4 6 0
London United Trams, 4 % Deb.	100	4	4	60 — 64 xd	..	6 5 0
Metropolitan Railway Consol.	100	1⅞	1⅝	46½ — 46¾	—1	3 9 6
Do. Surplus Lands	100	2⅜	2⅜	61 — 63	..	4 7 4
Do. 3¼ % Deb.	100	3¼	3¼	85 — 87	..	4 0 6
Do. 3¼ % Pref.	100	3¼	3¼	83 — 85	..	4 2 4
Do. 3¼ % Con. Pref.	100	3¼	3¼	79 — 81	..	4 6 5
Metropolitan District Ord.	100	Nil	Nil	33¾ — 34½	+1	Nil
Do. 6 % Deb.	100	6	6	136 —139 xd	..	4 6 4
Do. 4 % Deb.	100	4	4	92 — 94 xd	..	4 5 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	83 — 85	..	5 5 11
Do. 3¼ % Gtd.	100	3¼	3¼	75 — 77	..	4 10 11
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	85 — 89 xd	..	5 1 2
Do. 5 % Deb.	100	5	5	91½ — 94½	..	5 5 10
Potteries, Ord.	1	4½	..	3/32 — 5/32	..	..
Do. 5 % Pref.	1	5	5	1/16 — 3/16	..	7 5 6
Do. 4½ % Deb.	100	4	4½	82 — 85	..	5 6 0
South Metro. Trams, 6 % Pref.	1	..	..	3/32 — 5/32	..	8 0 0
Do. 4 % Deb.	100	..	4	63 — 68 xd	..	5 17 8
Underground Elec. Railways	10	..	..	3½ — 3⅝	+ 1/32	Nil
Do. "A"	1/-	4½	..	1/16 — 3/16	..	Nil
Do. 6% First Cum. Inc. Deb.	100	1½	6	108 —110	..	5 9 1
Do. 4½ % Bonds	100	Nil	4½	96 — 98 xd	..	4 11 10
Do. 6 % Income	100	3	6 †	89 — 90	..	6 13 4
Yorkshire (West Riding), Ord.	5	4½	..	1/32 — 3/32	..	Nil
Do. 6 % Pref.	5		3†	3 5/16 — 3 13/16 xd	+ 1/32	3 18 8
Do. 4½ % Deb.	100		4½	80 — 84 xd	..	5 7 2

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4 3/32 — 5 xd	..	5 10 0
Do. 2nd Pref.	5	5½	5½	4 7/32 — 4 11/32 xd	..	5 17 4
Do. 4 % Deb.	100	4	4	90 3/32 — 92 3/32 xd	..	4 6 6
Do. 4½ % Deb.	100	4½	4½	94 1/32 — 96 1/32 xd	..	4 13 3
Do. 5 % Deb.	100	5	5	95 1/32 — 97 1/32	..	5 2 6
Auckland Trams, 5 % Deb.	100	5	5	99 —101 xd	..	4 19 0
Bombay Elec. S. & Trams, Pref.	10	6	6	10 3/32 — 11 1/32	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94 — 96 xd	..	4 13 9
Do. 5 % 2nd Deb.	100	5	5	97 — 99	..	5 1 0
Brazilian Traction Light and Power	$100	..	6†	86 1/32 — 88 1/32	—2 1/32	6 15 7
Brisbane Trams Invs., Ord.	5	8	8	6 7/32 — 7 3/32	..	5 8 6
Do. 5 % Pref.	5	5	5	4 3/32 — 5 1/32	..	4 8 11
Do. 4½ % Deb.	100	4½	4½	97 —100 xd	..	4 10 0
B. Columbia Elec. Rly., Def.	100	8	8½	120 —125	+5	6 8 0
Do. Pref. Ord.	100	6	6	106 —111	+2	5 8 1
Do. 5 % Pref.	100	5	5	100 1/32 — 108 1/32	+1 1/32	4 16 7
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —108	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	100 —102	..	4 8 8
Do. 4½ % Con. Deb.	100	4½	4½	94 1/32 — 96 1/32	+1 1/32	4 8 1
Calcutta Trams, Ord.	5	7	5†	5 3/32 — 5 5/32	..	5 14 3
Do. 5 % Pref.	5	5	5	4 13/32 — 5 1/32 xd	..	4 18 9
Do. 4½ % Deb.	100	4½	4½	96 1/32 — 98 1/32 xd	..	4 11 5
Cape Electric Trams	1	2½	5	1 1/32 — 1 3/32	..	6 3 1
City Buenos Aires Trams (1904)	5	5	5†	5 1/32 — 5 3/32	..	4 10 11
Do. 4 % Deb.	100	4	4	92 — 97 xd	+1	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90 1/32 — 94 1/32	..	5 5 10
Havana Elec. Rly., 5 % Bonds	$1000	5	5	97 —101	..	4 19 0
Kalgoorlie Elec. Trams	1	Nil	..	1/32 — 3/32	..	Nil
Do. 5 % A Deb.	100	5	5	85 — 90	..	5 11 1
Do. 5 % B Deb.	100	5	5	25 — 35	..	..
La Plata Elec. Trms, Ord.	1	Nil	..	1/32 — 1/16	..	..
Do. Pref.	1	6	..	3/32 — 1 3/32	..	5 16 6
Lisbon Elec. Trams, Ord.	1	6	4½d.	1 1/32 — 1 3/32	..	4 9 8
Do. 6 % Pref.	1	6	6	1 — 1 3/32 xd	..	4 16 0
Do. 5 % Deb.	100	5	5	89½ — 91½ xd	+ 1/32	5 5 10
Madras Elec. Tr. (1904), Deb.	100	5	5	101 —103 xd	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	90 — 93	..	5 7 6
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98½ —100½	..	4 19 6
Mexico Trams Com.	$100	7	7†	94 — 97	—3	7 4 5
Do. Gen. Con. 5 % Bonds	..	5	5	89 — 92	+1	5 8 8
Do. 6 % Bonds	100	6	6	92 — 95 xd	..	6 6 4
Para Elec. Rlys. & Lt., Ord.	5	10	10	6 3/32 — 7 1/32	..	7 0 4
Do. 6 % Pref.	5	6	6	4 3/32 — 5	..	6 0 0
Do. 5 % 1st Deb.	100	5	5	98 —100	..	5 0 0
Perth (W.A.) Elec. Tr., Ord.	1	5	5½	1 1/32 — 1 3/32	..	4 0 0
Do. 5 % 1st. Deb.	100	5	5	102½ —105½ xd	..	4 14 9
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 1/32 — 5 3/32 xd	..	5 4 4
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97 xd	..	4 12 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	99 —101	+ 1/32	4 19 0
Do. 5 % Mort. Bonds	100	5	5	91 — 93	+1	5 7 8
Sao Paulo Tram, Lt. and P., 5 % 1st Deb.	$500	5	5	96 1/32 — 98 1/32 xd	..	5 1 6
Singapore Trams, 5 % Deb.	100	5	5	88 1/32 — 87 1/32	..	5 14 3
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	7	7	4 3/32 — 4 7/32 xd	..	7 3 7
Do. 6 % Pref.	5	6	6	4 1/32 — 5 3/32 xd	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	97 — 99	+ 1/32	5 1 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	98 1/32 — 101 1/32	..	4 8 9

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	3/32 — 7/32	..	6 17 2
Do. 6 % Pref.	1	6	6	3/32 — 7/32	..	6 17 2
Babcock & Wilcox	1	28	16	2 13/16 — 3 1/16	+1/16	5 4 5
Do. Pref.	1	6	6	1 1/32 — 1 3/32	..	4 7 3
British Aluminium, Ord.	1	Nil	..	1/32 — 1	..	..
Do. 6 % Cum. Pref.	1	Nil	6	3/32 — 5/32	..	5 17 2
Do. 5 % Prior Lien Debs.	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	83 — 86	..	5 16 3
B.I. & Helsby Cables	5	10	10	7 3/32 — 8	..	6 5 0
Do. Pref.	5	6	6	5 3/32 — 6 3/32	..	4 14 1
Do. Deb.	100	4½	4½	99 —102 xd	..	4 8 3
British Thomson-Houston, Deb.	100	4½	4½	97 — 99	..	4 11 0
British Westinghouse, Pref.	5	Nil	Nil	3/32 — 1/8	..	Nil
Do. Deb.	100	4	4	65 — 69 xd	..	5 16 0
Do. 6 % Prior Lien	100	6	6	99 —102	..	5 17 8
Browett, Lindley, Ord.	1	..	..	2/- —3/-	..	Nil
Do. Pref.	1	..	..	4/6 —5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — 1/32	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	70 1/32 — 75 1/32 xd	..	6 12 5
Do. 4½ % Deb.	100	4½	4½	88 — 48	..	10 9 4
Do. 4½ % Second Deb.	100	4½	4½	23 — 27 xd	..	16 13 4
Callender's Cable	5	15	15	10 3/32 — 11 1/32	..	6 10 5
Do. Pref.	5	5	5	4 3/32 — 5 1/32 xd	+ 1/32	4 17 7
Do. Deb.	100	4½	4½	98 —101	..	4 9 1
Castner-Kellner	1	20	20	33 1/32 — 33 3/32	..	5 6 8
Do. Deb.	100	4½	4½	103 —106	..	4 4 11
Crompton & Co.	8	Nil	..	0 — 1/32	..	Nil
Do. Deb.	100	5	5	57 — 62	..	8 1 4
Dick, Kerr	1	5	Nil	3/32 — 5/32	..	..
Do. Pref.	1	6	6	3 3/32 — 3 5/32	..	7 13 10
Edison & Swan, A, £8 paid	5	Nil	..	0 — 1/32	..	Nil
Do. fully paid	5	Nil	..	1 1/32 — 1 3/32	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62 xd	..	6 9 1
Do. 5 % Second Deb.	100	5	5	65 — 70	..	7 2 10
Electric Construction	2	2½	3 1/32	1 1/32 — 1 3/32	..	5 14 4
Do. Pref.	2	7	7	1 3/32 — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7 1/32 — 8	..	8 5 8
Do. Deb.	100	5	6	92 — 94	..	5 4 2
General Electric, 6% Pref.	10	5	6	9 3/32 — 10 1/32 xd	..	5 14 3
Do. Deb.	100	4	4	88 — 93	..	4 6 0
Henley's, Ord.	5	15	15	12 — 12 3/32	..	5 17 8
Do. Pref.	5	4½	4½	4 3/32 — 5	..	4 10 0
Do. Deb.	100	4½	4½	99 1/32 — 101 1/32	..	4 8 8
India-Rubber, G. & T.	10	..	7½	11 — 12 xd	..	6 5 0
Do. Pref.	10	5	5	9 — 10 xd	..	5 0 0
Telegraph Construction	12	17½	20	35 — 37	..	6 9 10
Do. Deb.	100	4	4	95 — 97 xd	..	4 2 6
Willans & Robinson	1	Nil	..	1/16 — 3/16	..	Nil
Do. Pref.	5	Nil	..	1/32 — 3/32	..	Nil
Do. Deb.	100	4	4	55 — 57	..	7 0 4

* Unless otherwise stated, all shares are fully paid. † Interim dividend. ‡ Dividend of 4 per cent. guaranteed by Underground Electric Railways.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING MAY, 1913.

The returns of electrical exports and imports during May show an increase and decrease respectively in value, as compared with the April figures. The exports for the month amounted to £638,271, as compared with £592,621 in the previous month. The total, however, includes £218,809 worth of telegraphic material (a figure which includes a very large submarine telegraphic export to the Dutch Indies), and the balance of general business valued at £417,462, was considerably less than in April.

The imports for the month were valued at £224,681, which compares with the April total of £263,268, while the re-exports reached £34,569, or over £11,000 more than in the previous month.

Looking through the various items of the exports, the machinery, battery and telephonic sections compare badly with the previous month, while some improvement is shown in the cable, fittings and lamp sections.

The imports, however, show a considerable falling off in value, except as regards telegraphic and telephonic material and carbons, the values of which were slightly in excess of the April ones.

Argentina, India, Canada and Brazil were good customers during the month, although, of course, the exceptional telegraphic export to the Dutch Indies, dwarfs all the other entries in the export table.

As regards the importers into this country, Germany retained the controlling interest, with the U.S.A. far ahead of the remaining countries.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	735	1,535	77	20	1,574	127	18,547	482	609	98	604	1,046	25,454
Germany	2,844	521	...	914	...	...	3,351	27	48	450	43	479	8,677
Netherlands, Java and Dutch Indies ...	533	2,161	168	10	25	212	1,542	29	2	20	91	136,280	141,073
Belgium	403	249	108	48	261	31	1,398	442	...	106	855	463	4,364
France	497	...	3,657	...	14	65	4,390	322	...	...	139	334	9,418
Portugal	381	13	94	22	591	7	136	...	30	13	428	310	2,025
Spain, Canary Isles and Spanish N. Africa...	1,372	656	553	10	435	703	3,934	103	8	25	791	311	8,901
Switzerland, Italy and Austria-Hungary ...	2,187	320	1,023	31	119	...	4,886	198	50	593	...	957	10,364
Greece, Bulgaria, Roumania and Turkey ...	65	116	32	10	...	...	647	...	58	...	...	41	969
Channel Isles, Gibraltar, Malta and Cyprus...	102	84	7	82	...	181	155	...	12	...	20	316	959
U.S.A. and Cuba	342	105	107	41	...	30	1,090	...	...	10	...	1,276	3,001
Canada and Newfoundland	412	9,978	361	531	...	3,090	20,403	2,186	836	12	1,515	12,518	51,842
British West Indies and British Guiana ...	140	29	417	80	41	...	260	...	2	14	77	89	1,149
Mexico and Central America	98	714	47	40	...	...	566	...	22	57	304	1,466	3,314
Peru, Paraguay and Uruguay	302	749	337	79	...	15	417	241	146	...	31	962	3,279
Chile	740	160	458	563	17	92	6,641	634	57	...	116	959	10,437
Brazil	2,334	559	1,843	315	209	954	6,495	1,297	143	17	1,051	30,374	45,591
Argentina	3,350	12,953	1,104	2,380	443	1,006	15,687	4,315	388	63	9,338	5,410	56,437
Colombia, Venezuela, Ecuador and Bolivia...	118	199	...	...	...	13	...	...	305	...	143	1,417	2,195
Egypt, Persia and Morocco	458	1,368	756	24	...	4	1,405	39	8	...	27	344	4,433
British West Africa and St. Helena ...	100	71	46	192	...	186	261	...	235	...	128	11	1,230
Rhodesia, O.R.C. and Transvaal	1,981	7,161	514	907	...	172	3,945	...	208	...	71	1,223	16,182
Cape of Good Hope	1,530	3,202	341	880	42	668	3,514	429	1,325	...	2,593	1,597	16,121
Natal	1,087	6,630	485	255	193	220	2,570	44	1,504	133	201	246	13,568
Zanzibar, Brit. E. Africa, Mauritius & Aden	345	38	...	168	...	21	1,072	...	77	14	25	751	2,511
Azores, Madeira and Portuguese Africa ...	371	907	62	128	...	66	3,727	6	47	...	34	1,153	6,501
China and Siam	1,385	3,815	867	1,132	...	444	2,642	99	31	30	350	...	10,795
Japan and Korea	815	130	95	211	...	1,550	11,289	2,216	31	...	59	...	16,396
India	6,735	10,333	4,707	2,366	681	817	15,647	4,420	3,893	245	495	2,834	53,173
Ceylon	549	589	68	64	...	30	1,013	33	142	...	...	531	3,019
Straits Settlements, Fed. Malay States, Brit. N. Borneo and Sarawak	1,152	716	794	230	...	...	1,214	1,416	78	6	2,872	3,459	11,937
Hong Kong	323	212	82	133	...	387	597	...	...	...	38	37	1,809
West Australia	502	677	9	507	...	459	1,056	...	60	...	166	44	3,480
South Australia	504	275	466	74	90	533	521	3,586	2	...	154	5,361	11,566
Victoria	3,086	6,879	459	654	25	370	4,229	299	638	16	1,317	833	18,805
New South Wales	2,409	4,843	677	1,098	...	596	3,816	725	337	3	15,359	4,075	33,938
Queensland	178	1,431	710	89	...	...	231	795	53	...	243	318	4,048
Tasmania	...	...	...	...	...	...	19	...	...	...	121	...	140
New Zealand and Fiji Islands	1,198	3,730	485	232	176	542	2,865	431	779	...	7,748	984	19,170
Total, £	41,663	84,108	22,016	14,520	4,936	13,591	152,178	24,814	12,164	1,925	47,547	218,809	638,271

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	...	...	...	81	...	14	4,488	80	629	...	9,624	14,916
Germany	3,087	23,375	1,887	10,899	5,753	3,016	59,545	215	1,843	8,106	7,174	124,900
Holland	...	33	...	546	699	...	80	120	...	...	...	1,478
Belgium	1,040	4,060	346	44	30	28	4,653	...	378	165	4,762	15,506
France	1,025	270	1,206	1,144	116	735	926	755	396	5,198	226	11,997
Switzerland	177	120	20	8	...	488	1,839	...	...	181	22	2,855
Italy	20	4,987	...	...	...	...	166	...	...	96	60	5,329
Austria-Hungary	39	284	...	388	56	...	...	...	5	387	...	1,159
United States	4,478	105	2,022	18	115	...	7,593	22,238	299	29	2,239	39,136
Total, £	9,866	33,234	5,481	13,128	6,769	4,281	79,290	23,408	3,550	14,162	24,107	217,276

Additional imports: Spain, carbons, £211; Canada, fittings, £44, telegraph material, £7,150.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

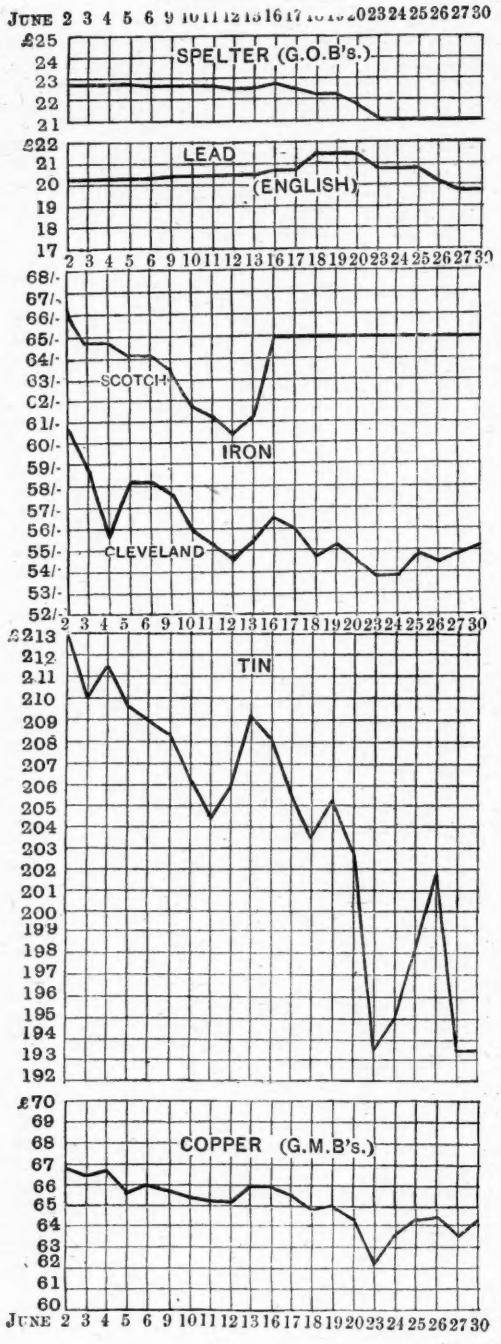
Various countries, mainly as above ...	18,661	1,642	...	1,955	775	...	10,605	...	308	420	203	34,569

TOTAL EXPORTS: £638,271. TOTAL RE-EXPORTS: £34,569. TOTAL IMPORTS: £224,681.

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

METAL MARKET.

Fluctuations in June.



THE BEDFORD L.G.B. INQUIRY.

Some time ago the Bedford Corporation applied to the Local Government Board for permission to borrow the sum of £11,590 for new generating plant for the electricity undertaking. Inquiries were held by the L.G.B. in connection with this application on March 25th and April 10th last, but in consequence of a reference made during the proceedings it was decided to hold a further meeting, and Mr. T. C. Ekin, M.Inst.C.E., attended at the Town Hall, Bedford, for that purpose on the 18th ult.

Mr. Stimson, the town clerk, represented the Corporation, and Mr. E. Pollock, K.C., and Mr. Mears appeared for Messrs. W. H. Allen, Son and Co., Ltd., the British Westinghouse Co., Messrs. Willans and Robinson, Ltd., and Messrs. Mirrlees, Bickerton & Day, Ltd. Several representatives of each of these firms were also present. The inquiry was held for the purpose of investigating certain statements made in reference to Messrs. Allen's tender for a Diesel engine set, and the evidence given was taken on oath.

It appeared that in August last Messrs. Allen tendered for the required generating plant at £7,950, whereas, when in November they were asked to revise their figures, their offer was £8,980, an increase of £1,030.

Mr. Richard Allen was first called. He stated that he dealt with the technical side of the tender, his brother, Mr. Harold Allen, being responsible for the commercial side. Between August and November there was a considerable rise in the cost of materials, and it was also necessary to reconsider the sum allowed for contingencies. The revised tender was sent in on Saturday, November 9th. He discussed the matter with his brother on Monday, November 4th, and the following day they fixed the new contract price of £8,980. The amount allowed for increase in cost of materials was 12 per cent., representing about £800 of the extra £1,030. Tenders were being invited from five selected firms, but they did not know who they were. They, however, anticipated that Messrs. Mirrlees, Bickerton & Day, Ltd., would be amongst them, and on November 4th they wrote to them pointing out their desire to secure this order, and suggesting a discussion of the subject the following day. They also approached during the week Messrs. Willans & Robinson and the British Westinghouse Co. As a final result of the negotiations between the three firms, Willans and Robinson agreed to accept £100 towards the expenses of tendering, the British Westinghouse Co. £200, and Mirrlees, Bickerton and Day the sum of £250, the last-named firm declining to quote. Mr. R. Allen pointed out that their tendered price was settled on Tuesday, the 5th inst., before any of these arrangements were made, and that, therefore, the Corporation were unaffected by them. His firm had not built any Diesel engines, but were very anxious to do so, and for this reason they desired to get this order, as they could watch its performance and gain experience of its working. They had built the whole of the engines in use in the generating station, and naturally did not want any other maker to come in.

Questioned by the Inspector, Mr. R. Allen admitted that they paid this total sum of £550 in order to get the other contractors to raise their prices to protect the offer made by his firm. When they approached them they did not know that there would be anything to pay.

The Inspector said that the serious part of the matter was that the arrangement between four of the five firms who were asked to tender prevented the competition which was so necessary to protect the Bedford Corporation.

Mr. Pollock said that there was no necessity for the Corporation to select the lowest tender, and the sum of £8,980 was a fair price for the work to be done.

Mr. Harold Allen explained the difference in the August and November tenders. £800 out of the £1,030 was due to rise in cost of materials, and of the remaining £230, two-thirds was absorbed by alterations caused by the alternator. Mr. H. Allen stated that this was the first transaction of the kind they had entered into, and repeated that the price of £8,980 was in no way affected by the promise of payments to possible competitors.

Mr. W. M. Mordey, M.I.E.E., stated that, in his opinion, the tendered price of £8,980 was a reasonable one.

Mr. F. R. Davenport, of Messrs. Willans & Robinson, said that he thought the plan followed was a reasonable one. The fact that the parties were members of the British Electrical and Allied Manufacturers' Association had no connection with these transactions.

Mr. H. S. Russell, sales manager for Messrs. Mirrlees, Bickerton and Day, confirmed Mr. Allen's account of the negotiations, and stated that he considered he was entitled to be reimbursed for the expenses his firm had been put to in this matter. If they had tendered for the work in November their August price of £7,208 would have needed increasing by at least £1,000. He did not know of any previous case when exactly this arrangement had been made, but he had known manufacturers to put their heads together in connection with contracts, and make a pooling arrangement, by which the successful competitor paid the expenses of the rest.

Mr. Baldwin, of the British Westinghouse Co., in his evidence said that, assuming that their engine would not require alterations to the buildings, their figure in November would have been £9,157, as against Messrs. Allen's £8,980.

Mr. Pollock then reviewed the case, pointing out that by their action Messrs. Allen, Son & Co. did not eliminate competition, and that the tendered price was fixed before the arrangements were made.

The town clerk said it would give great satisfaction to the Corporation to know that no part of the sum they were asked to find for the tender had reference to any money to be paid to the other competitors. He thought, however, that the Corporation had a grievance, in that some of the other competitors might have been willing to forgo some of the extra cost of materials in order to get the contract. They knew that Messrs. Allen, Son & Co. had not built an engine of this type, but they had asked them to quote, and they regretted that these negotiations had taken place.

The inquiry then closed.

Patent Applications. — Application for restoration of patent No. 14,345, of 1908 ("Improved grate arrangement for refuse-consuming furnaces") has been made by Aloys Fried and Maschinenbau-Anstalt Humboldt Akt.-Ges.

Orders have been made restoring the following patents:—

No. 8,328, of 1907, "Improvements in and relating to conveyors"; E. M. Bassler.

No. 2,292, of 1909, "Improvements relating to the liquefaction of illuminating gas by pressure"; Hermann Blau.

OUTSIDE SHOP LIGHTING ON THE HIRE SYSTEM.

By "INTERESTED."

We all know that outside shop lighting is no longer a monopoly controlled by gas companies, and electricity has obtained a sure footing. Will she keep that advantage? Success is assured if customers are satisfied, and it is up to the electricity works people to retain their customers by "making good," or making certain they are satisfied. Satisfaction was, and is now, one of the strong points with our rivals. No end of trouble is taken to attend to the wants of their customers. The result is they are satisfied, and are not left grumbling, or in a state of discontent, ready to grasp at any new form of illuminant brought to their notice. And it must not be forgotten that outside shop lighting, whether it be done by electricity or gas, is an advertisement for whichever illuminant is used.

Electricity works have lately followed the example of others in the way of hire-maintenance agreements, and it is in this particular direction that the works staff have a certain amount of direct control, *i.e.*, where a hire-maintenance agreement is in force. The work of trimming, cleaning, or repairing may be carried out by contractors' men or the works staff. In either case nothing is lost and much may be gained by ensuring the satisfaction of consumers by careful attention to lamps, lanterns, &c., and a ready explanation for any apparent discrepancy in the accounts.

I have an instance in mind where men called weekly at a certain shop to attend to some lanterns. The consumer himself seldom saw the actual work done, for the simple reason that he was usually out at the time of the workmen's visit. One week of very bad weather with business slack in consequence; one of his lamps broken; the lanterns semi-obscured with mud and rain—he commenced blessing electricity in no small degree. A chance visit by a "high-pressure" man, and behold a change-over from electricity to high-pressure gas under a three years' agreement. This serves to illustrate the importance of keeping consumers satisfied, more especially those with whom business is transacted on hire or hire-purchase.

A rather good idea for keeping in touch with consumers such as these has been brought to my notice, and I give below copies of the cards in use. The printed matter thereon explains their purpose.

The great point is that upon every occasion when lamps or lanterns are attended to or cleaned by the electricity works men, the attention of the consumer is directed thereto by

ELECTRICITY DEPARTMENT.

HIRED FITTINGS MAINTENANCE.

Consumer .....

Address .....

.....

Workmen to obtain consumer's signature on completion of work.

Date.	Time finished.	Consumer's signature.

Fig. 1.

the fact of his signing the card after the work is done. Also, in the event of his shop being closed when the lamp attendant has finished cleaning, or trimming, as the case may be, a card (fig. 2) is dropped in the letter box, which reminds the consumer that his lamps or lanterns have again received attention. Of course, should the lighting be anything but satisfactory, the periodical visits of the attendants asking for signatures remind him to take the question up with the responsible officials forthwith. This signing a card each time the lamps are attended to is a small matter in itself, but it is certainly a good way of keeping in touch with consumers and is of assistance in retaining satisfied consumers. When a client feels that value is being obtained for money paid he is satisfied, and that forms a very strong weapon to be turned at the proper moment upon a rival.

Now that hire or hire-purchase is on the increase with regard to electricity, no time should be lost in securing to every customer satisfaction with his goods. Municipalities

ELECTRICITY DEPARTMENT.

HIRED FITTINGS MAINTENANCE.

Date.....

Dear Sir,

Please note that your outside fittings were cleaned, and left in working order at.....to-day, but as the premises were closed your signature on maintenance card could not be obtained. All complaints should be addressed at once to the Engineer.

To .....

.....

Fig. 2.

are by far the chief offenders in this respect, for they look aghast at the expenditure of a few pounds for show purposes, or for a convincing trial on behalf of a disappointed client. They do not seem capable of looking far ahead in order to see what may be lost or gained without or with the show or trial.

Oh! for a business Council!

NOTES FOR INSTALLATION INSPECTORS.

By "ELEMENT."

The duties of an inspector of installations for a supply authority cannot by any means be considered as purely of a routine nature. Every month we hear of improvements in the design and construction of wiring accessories, and as the new fittings find their way, through the wiring contractor, to the electricity consumer's premises, the inspector must keep himself in touch with all the latest installation devices with a view to finding whether or not they conform to the rules and regulations under which the supply is given. The man entrusted with this important work should, therefore, possess an unbiased judgment and an up-to-date knowledge of electric installation practice. He should also have a strong individuality, and be capable of carrying in his memory the substance of every clause in the supply authority's regulations.

In many towns the number of new consumers being added to the supply does not warrant the appointment of a special inspector of wiring, and the duty of testing installations is allotted to the meter inspector, who, probably, has never had any previous experience of wiring work beyond a superficial knowledge, obtained from a text-book, of how good wiring *should* be executed. The inspection then becomes a mere measurement of insulation resistance to "earth," and a cursory glance round the premises in search of examples of bad workmanship or defective materials. Where this method of examination is in vogue, the "unscrupulous contractor," or his underpaid wireman, can easily cover up the defects of an installation, and have the satisfaction of informing his customer that the job has been passed as electrically and mechanically perfect. The consumer having full confidence in the contractor's work, and knowing that it is in the supply authority's interests also that the job should be satisfactory, accepts the inspector's report, and takes over the installation.

No trouble may be experienced during the first few months, but afterwards, when faults begin to develop, and fuses to melt frequently, the consumer becomes doubtful as to whether or not he has after all obtained full value for the money he has expended on the installation. The contractor, when called upon to make good the defects, can, of course, advance many contingencies which *might* have been responsible for the trouble, but in very few instances will he

allow it to be suggested that bad workmanship or material is at the root of the matter. Yet such is often the case. Inferior cable may have been used; joints may not have been properly made and efficiently insulated; and loops may have been carelessly bound in terminals at switches and ceiling roses.

A common trick of some wiring contractors is to run old cable, or smaller gauge cable, in portions of an installation where its detection will be almost an impossibility. Short pieces of good class heavy cable can be jointed to the old cable at each end, and so drawn into tubing, or laid in wood casing, that only the good quality cable can be examined without withdrawing the wire from its encasement. The writer remembers one lighting installation, which, having been fitted up with low-grade cable, was condemned, and tenders were asked for its removal and replacement by an entirely new installation. When the new work was completed by the successful contractor, it was discovered that almost all the old wiring had been utilised in places where it was considered least likely to be minutely inspected.

Another dodge of the reckless wireman is to place a piece of tubing at each end of a concealed "run," the intervening wires being loosely laid without mechanical protection of any kind. Shirking of this kind very often takes place where difficulty is met with in placing tubes in a wall behind the lath and plaster. If it is impossible to get a rigid steel tube into such a position, a piece of composition tubing should be insisted on. A great many faults are brought about by the abrasion of cables where these enter tubes, and too great attention cannot be paid to the bushing of all tube-ends, especially behind distribution fuseboards, branch switches, and wall sockets.

When an installation is ready for testing, the inspector, after receiving written notice from the contractor, should spend some considerable time on the consumer's premises examining the materials and accessories forming part of the installation, with the object of ascertaining whether they conform to the regulations or not. The "break" and capacity of fuses and switches, the method of grouping lamps, &c., in circuits, and the size and quality of conductors should be carefully noted. The lids of one or two inspection boxes, or a piece of wood cover, should be removed in various sections of the installation, and the earth wire on a tubing job should be traced from the conduit to the water pipe.

A strict earthing regulation is a sore point with the jerry contractor, and many are the artifices adopted to cheat the wiring inspector. Cases have been known in which the earth wire was shown connected to the tubing and to the water pipe, but investigation led to the discovery that the earth wire was not continuous, the ends terminating at points between which the wire was supposed to be hidden from view.

In another instance, a small switch had been placed in an inconspicuous position and connected to the earth wire, so that when the earth test was taken, the switch was "off," but when the inspector connected his test lamp between the live supply terminal and the conduit system, the lamp indicated that the earth wire was continuous, the contractor's youngest apprentice, by this time, having slipped away unobserved and put on the earth-wire switch.

Each fuse in the distribution board should be looked to by the inspector. In some types of cut-outs, fuse wire can be inserted in the cut-out but not connected to the terminals, so that if an insulation test is being conducted from the main cables, the circuit which this fuse controls will not be included. A defective circuit may thus be overlooked at the test, and it is a simple matter for the wireman to make good the fuse connection before the installation is connected to the supply mains. It is recalled that in one job coming under the writer's notice, the fuse wires in a pair of cut-outs connected to a circuit of very low insulation resistance were cut through by a knife, and only a very cute inspector could have detected the break in the fuse wires. The intention of the contractor was to bring the broken wires together after the test, by removing and re-inserting the fuse bridge while the inspector's attention was attracted to another part of the installation.

In another lighting installation of about 60 lights an eight-way distribution fuseboard was fitted up to control the whole of the lights. To outward appearances the grouping of the various lamps from the boards seemed to have been systematically arranged and carried out. On further inspection being resorted to, by the temporary removal of the distribution box, the inspector was surprised to find that the whole installation was fed from three circuits only, and small pieces of cable had been clamped in the remaining five pairs of terminals to complete the deception.

The writer is of opinion that the test applied by the average installation inspector is not of very material value as an indication of the present condition of an installation. The insulation test certainly serves to show whether an "earth" exists on the premises, but it cannot reasonably be held as the basis for passing or condemning the installation. The only satisfactory examination of a job must be made by a competent inspector periodically, while the installation is being fitted up, and a reputable contractor would welcome, rather than discourage, an innovation such as this in towns where at present the inspection is left to a meter repairer.

Nowadays, ironmongers and gas fitters have inaugurated electric wiring branches, and the tendency has been to lower the general standard of wiring considerably, by the use of cheap cable and accessories, and by engaging improvers and apprentices to do the work. There are, however, many reliable contracting firms who will not condescend to employ anything but the best workmanship and materials. It is with a view to encouraging these firms that a qualified inspector, or inspectors, should be appointed by every supply undertaking in the country, as the mere issue of rules and regulations will never ensure a high standard of wiring work being maintained by electrical contractors and their workmen.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"R. D. G." writes:—"A power company proposes giving a low-tension supply from lines erected on steel poles, below the E.H.T. lines, a light guard wire construction protecting the L.T. lines. In the event of contact between the E.H.T. and the L.T. lines, and consequent damage to the consumer's apparatus, what would be the position of the consumer? Would he have a claim against the power company?"

*** There is little doubt, having regard to the case of Midwood *v.* Manchester Corporation (1905) 2 K.B., 597, that in the circumstances above described the undertakers would be liable as for nuisance and negligence. It may be remembered that liability for nuisance is reserved by Sec. 81 of Schedule to the Electric Lighting (Clauses) Act, 1899, and a similar clause is generally to be found in each Power Act.

"Thrust" writes:—"I should be much obliged if you would inform me as to whether an electrical department controlled by an Urban District Council can legally carry out the work of free wiring of private property, *i.e.*, houses, hotels, chapels, &c., the cost of such work to be defrayed from the revenue or net profits of the electrical undertaking?"

*** Without access to a copy of the provisional order under which the Urban District Council in question has power to supply electricity, it is difficult to provide an answer to this query. One thing is plain: that unless the Council has express power to expend the ratepayers' money on free wiring, it cannot indulge in this form of municipal trading. It is mentioned, however, in Mr. Shiress Will's book, entitled "The Law of Electric Lighting," 2nd edition, page 29, that "since 1899 free wiring (in which phrase are included arrangements for payment by way of rent, or by instalments spread over a number of years' purchase on the hire system, &c.), has become very common, and is to be met with where electric energy for lighting purposes is afforded by local authorities as well as by companies."

"Thrust" had better apply at the offices of the Urban District Council and obtain inspection of the provisional order.

Oulton Broad.—The Mutford and Lothingland R.D.C. on June 26th, received from the Oulton Broad Electricity Co. an intimation of its intention to apply for a prov. order for electric lighting at Oulton and Carlton Colville. The question of opposing the application has been referred to a committee.

RECENT DEVELOPMENTS AT STUART STREET STATION, MANCHESTER.

(*Concluded from Vol. 72, page* 1073.)

The general arrangement of the Kinetic air ejector is shown in the accompanying drawing. The air and water leave the condenser through a receiver from which the air is withdrawn by the steam jet and forced into the Kinetic ejector, and the water is withdrawn by a rotary pump and discharged into the Kinetic tank.

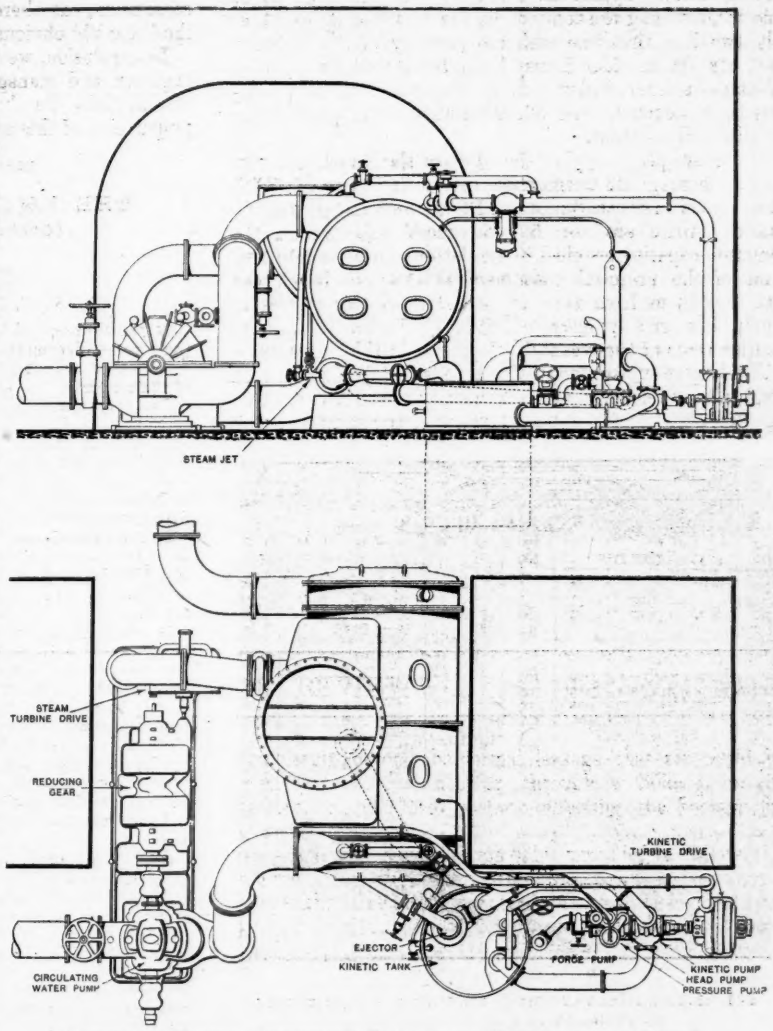
An ordinary centrifugal pump draws this water from the tank and delivers it under pressure to the water jets.

The condensate pump is of the two-stage type. The function of the first stage is to discharge into a receiver pipe in communication with the condenser. A suction head for the second stage pump is thereby established in the receiver pipe which admits of considerable variations without in any way affecting the suction head on the first stage pump, or, in other words, the system prevents the flooding of the condenser by giving greater stability to the pump that discharges the condensate to the feed tank.

It is obviously advantageous to drive these pumps by a steam turbine, as is done at Stuart Street, and to use the exhaust in the steam jet. Of the total heat in the steam which enters the turbine, about 83 per cent. still remains in the exhaust, and if this exhaust steam is led to the jet, it not only withdraws the air from the condenser, but also gives up all its heat to the feed water, a combined effect which is unequalled in thermal efficiency by any other known apparatus.

This condensing plant was guaranteed to give a vacuum of 27 in. when supplied with circulating water at any temperature between 75° and 80° F., and dealing with 110,000 lb. of steam per hour. When recently tested, it was found to be capable of maintaining a vacuum of 27·5 in. when supplied with water, about 48 times the feed, at 80° F., and dealing with 117,000 lb. of steam per hour. The plant had such a large margin beyond the normal leakage that air could be admitted to the condenser through a hole ¼ in. in diameter on full load without affecting the vacuum in the least.

In place of the usual large valve provided to isolate the condenser from the turbine in emergencies, a less costly arrangement is adopted, a water connection being fitted by means of which the condenser can be flooded in about a minute, as compared with three or four minutes required to shut the ordinary type of valve.



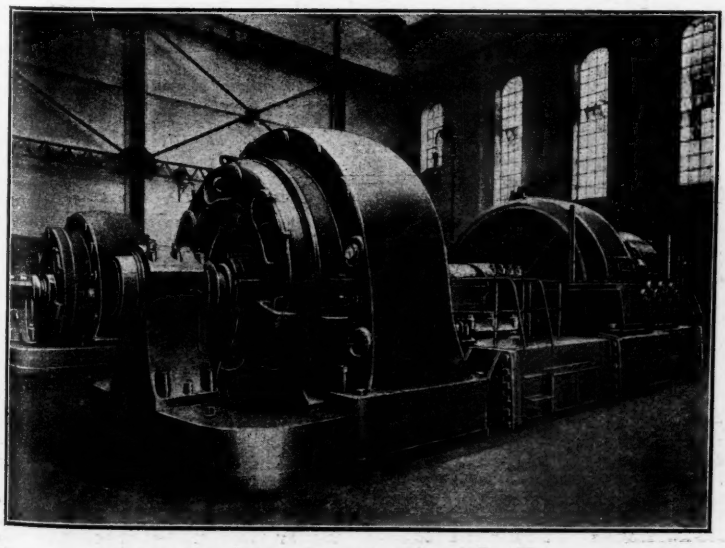
Contraflo Kinetic Condensing Plant with Turbine-driven Pumps, Stuart Street Station, Manchester.

The rotary air-pump is direct driven by a 72-H.P. Curtis turbine at a speed of 3,000 R.P.M., while the centrifugal circulating pump is driven from a 450-H.P. Laval turbine running at 7,500 R.P.M. through 10 to 1 reduction gearing. The latter pump delivers 750,000 gallons of circulating water per hour to the condenser.

The plant as a whole is an exceedingly interesing departure from the usual practice, the small size of the turbine-driven plant being in strong contrast to the adjoining electrically driven condensing plants with Edwards air-pumps.

The department has recently converted several of its natural draught cooling towers to forced draught, in order to get rid of the nuisance created locally by the discharged vapour under certain atmospheric conditions.

The *modus operandi* has been to fit



Howden-Siemens 8,000-kw. Turbo-Alternator, Stuart Street Station, Manchester.

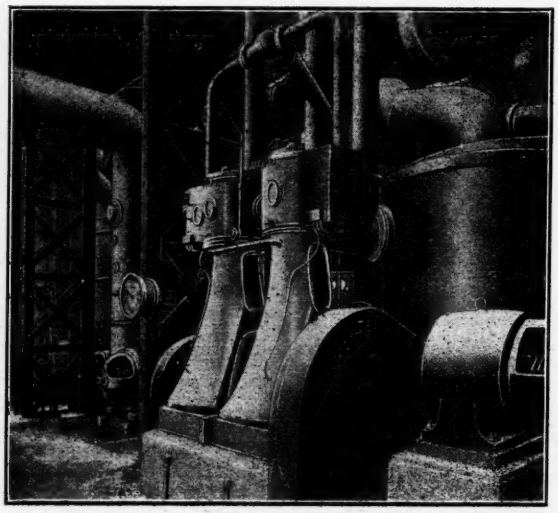
chain-driven fans to each tower, one motor being installed midway between each two fans.

Hydraulic tipping plant has also been installed to facilitate coaling operations, and two motor-driven turbine boiler feed pumps are being added to the existing plant.

In connection with the 15,000-KW. turbine unit on order, two additional marine type Babcock boilers, each of 40,000 lb. evaporative capacity, and two land type boilers by the same makers, each of 25,000 lb. evaporative capacity, are to be installed, bringing the total of boilers installed up to 46, or only two less than the ultimate capacity of the existing buildings—from which it may be gathered that the existing buildings at Stuart Street will in the near future be practically fully occupied, some 57,000 KW. of H.T. plant being installed and on order.

The above plant supplies the whole of the Manchester H.T. network through 22 Corporation sub-stations, two of which are installed in Stuart Street and Dickinson Street generating stations, there are also 59 consumers' sub-stations, the minimum capacity installed in the latter case being 100 KW. Some of the principal consumers' sub-stations have been described by us from time to time, but as this system of supply has greatly extended, it may be of interest to mention some of the recent developments in this direction.

The largest sub-station of this type is installed at London Road railway terminus, and contains two 800-KW. rotaries, together with two 900-K.V.A. three-phase transformers; this



ELECTRICALLY DRIVEN DRY-AIR PUMPS FOR BAROMETRIC CONDENSING PLANT, MANCHESTER.

plant operates the hydraulic cranes, capstans, &c., and the electric signalling installation, and an additional 125-KW. transformer is provided for the lighting service. Messrs. Armstrong, Whitworth & Co.'s works have two sub-stations, the first containing a 750-KW. and three 400-KW. motor converters and the second two 250-KW. motor converters, while a 500-KW. machine of the same type is being added. For the first sub-station there is an additional 1,500 KW. of converting plant on order.

In addition, Messrs. Armstrong, Whitworth have recently put down a 1,200-H.P. rolling-mill plant, which is also run off the Corporation's H.T. mains.

At Messrs. McConnell's mill, which is electrically driven, the various motors are supplied through five 500-KW. three-phase transformers (one spare); this mill is a branch of the Fine Cotton Spinners' Association and the Bengal Mill, another branch establishment, electrically driven from the Corporation supply, has three 500-KW. transformers installed in its own sub-station. Amongst others of the same class may be mentioned:—

Calico Printers' Association Works, Levenshulme.—Two 300-KW. rotaries and 350-K.V.A. transformers.

Mather & Platt, engineers.—Have added two 600-KW. motor-converters, also have two 200-KW. motor-converters.

Ashbury Railway Carriage Co.—One 700-KW. rotary and 800-K.V.A. transformer.

Great Central Railway, Gorton Works.—Three 300-KW. rotaries and 350-K.V.A. transformers.

Elm Street Corporation Cold Stores.—Changed from steam to electric drive; 250-KW. and 25-KW. transformers for power and lighting respectively.

Manchester Ice Co.—Changed from steam to electric drive; one 250-KW. transformer.

Marsland & Co.'s Cotton Mill.—One 500-KW. transformer for power and two 35-KW. lighting transformers.

Bazley Bros.' Cotton Mill.—Two 500-K.V.A. transformers (one spare).

Chas. McIntosh & Co., india-rubber manufacturers.—Recently introduced electric drive and installed one 500-KW. transformer.

These include a few of the more recent and larger power consumers; as there are 53 consumers with sub-stations, the list could obviously be much extended.

In conclusion, we are indebted to Mr. S. L. Pearce, chief engineer and manager to the Electricity Department, for the facilities he kindly placed at our disposal for the preparation of this article.

THE I.M.E.A. CONVENTION, 1913.

(*Continued from Vol. 72, page 1089.*)

Electric Automobiles.

By W. H. L. WATSON and R. J. MITCHELL.

THE paper presented by these authors contains rather over 100 pages of reading matter, illustrations, &c., and as lack of space does not allow of extensive reprinting, we propose to give a brief outline of the contents.

The paper states the case of the electric automobile at the present time, and necessarily contains a good deal of information which has already been published in our own columns and those of our American and English contemporaries.

The American industry in the building of electrics has already attained great importance, some 40 companies being engaged in the actual manufacture of complete cars. Of these seven make both industrial and pleasure vehicles, while about a dozen plants confine their energies exclusively to the commercial type. Some £12,000,000 worth of vehicles are in use, representing 20,000 cars, and the authors estimate a yearly demand of 65 million KW.-hours for these cars.

A striking feature of the American industry in commercial electrics is that 70 per cent. of the sales of vehicles during the past two years were repeat orders from firms who, having started experimentally, had gained enough confidence to change over completely to electrics for their city transport. Reference is made to the energetic campaigns of the various branches of the Electric Vehicle Association of America, and to the favourable conditions in this country as compared with America.

There appear to be over 130 separate models of electric vehicles on the American markets, about half being pleasure vehicles.

Industrial cars range from a 500-lb. parcel van to a 10,000-lb. coal truck.

Table I, at top of p. 37, gives the average figures relating to the principal features of about 60 models of American electrics.

Very lengthy statistics relating to the principal features of American car practice are given; it is pointed out that cheap ton mileage depends on employing fairly heavy trucks— a 10,000-pounder weighing four times as much as a 300-pounder truck, but carrying 33 times the load. Experience shows that it is most economical to make the commercial electric vehicle of moderate speed, able to maintain a uniform speed over distances of from 35 to 75 miles on a single charge. This leads to saving in wear and tear. There are even now well-authenticated cases of electrics having been in active commission for 12 years, and still going well for all their service. Although it is usual to assess the life of these machines at 10 years for depreciation purposes, there is little doubt but that their life will be much longer.

The authors have made many tests of the hill-climbing abilities of a ½-ton van of Anderson manufacture—including the carrying of a load of 1½ tons weight from London to Portsmouth, and much heavy work around Hampstead. Similar tests were made in the Newcastle district with complete success—many of the hills there have tested petrol-engined vans to their uttermost. The electric scores as a sure hill climber largely because of the valuable property of the series motor in that armature torque increases almost proportionately to the fall in speed, thus giving the necessary "draw-bar pull" when it is most wanted. As a pure speed machine the electric is admittedly quite unlikely to compete successfully with present-day petrol automobiles. It is, however, interesting to note that a specially-designed "Baker" electric has achieved the distance of 1 mile in a second less than a minute, its equipment including a 12-cell battery weighing 300 lb. and a motor scaling only a 100 lb.

The electric can accelerate more quickly than the majority of road vehicles. On a test made quite recently in the London streets, a 6-ton battery 'bus showed an acceleration of 4·5 ft. per second per second on the level—a figure 40 per cent. in excess of the average value of this factor applying to London omnibuses. Speed is of importance only to the extent of its effect in reducing total cost per ton-mile. The electric has shown itself to be the cheapest lands goods carrier extant, an indirect indication that moderate speed is most economical in the end.

The authors naturally devote considerable space to the question of accumulators, and describe in some detail the Edison cell, giving tabular data and curves showing the characteristics of the latter.

The Edison battery has been fully described in our pages on several occasions.

TABLE I.—AVERAGE CHARACTERISTICS OF AMERICAN COMMERCIAL ELECTRICS IN 1913.

Loading capacity in lb.	300	500	750	1,000	1,500	2,000	3,000	4,000	7,000	10,000
Vehicle weight in lb.	2,200	2,650	3,000	3,450	3,500	4,300	4,700	6,000	8,500	10,850
Battery capacity in A.H.	150	150	150	150	150	225	225	300	375	450
Battery weight (lead) in lb.	1,260	1,260	1,260	1,260	1,260	1,800	1,800	2,500	3,150	3,800
Battery weight (Edison) in lb....	840	840	840	840	840	1,260	1,260	1,800	2,250	2,700
Average miles per charge	70—80	75	65	55	50	50	45	40	35	35
Maximum speeds on hard level asphalt in M.P.H.	20	17·5	16	15	14	11	10·5	10·0	8	6·5
Speeds recommended by Electric Vehicle Assoc. in M.P.H. ...	20	20	16	13	11	10	9	8	7	6

NOTE.—Battery equipments are quoted *pro rata* of their average weight and capacity.

Controller systems and transmissions are described and illustrated in detail; the effect of different tires on the power taken, and the essential features of vehicle motors are discussed at some length. The authors state that there is not much to be said in favour of extra-high-speed motors, nor for motors running at very low speeds—for the motor weight saved by high speed entails more weight in transmission gear and two reductions therein—whilst the very slow speed motor costs more initially and weighs too much. On an average the best practice inclines to motor speeds of 800 to 1,000 R.P.M. or thereabouts. The usual construction of these machines favours a carcase of cast steel, generally of the four-pole type. Considering the extra cost of making the field carcase from laminations would be hardly more than 15 per cent., and that a reduction in weight of 25 per cent. is claimed for this method of construction, there appears to be an opening for improvement in such a direction. Whilst the weight question takes a relatively minor place in the design of heavy machines, it is by no means to be ignored. For pleasure cars and all higher speed work it is manifestly necessary to cut weight down as much as is consistent with reasonable overload capacity and mechanical stability. American vehicle motors appear to weigh from 80 to 180 per B.H.P. —the overload capacity being usually very high. Table II shows the normal output and weight of a series of American vehicle motors.

TABLE II.—IMPORTANT CHARACTERISTICS OF ELECTRIC VEHICLE MOTORS.

Speed. R.P.M.	Volts.	Amps.	B.H.P at 80 % effective.	Weight per B.H.P.
1,700	20	27	0·57	156
2,250	28	33	0·93	98
740	40	28	1·20	171
1,600	40	28	1·20	129
1,000	36	35	1·34	116
740	80	16	1·36	140
1,600	80	16	1·36	118
1,500	60	23	1·47	105
950	60	30	1·92	130
800	110	16·5	1·94	80
1,200	60	31	1·98	136
1,200	85	22	2·00	125
900	80	24	2·03	115
1,200	80	25	2·13	117
1,800	72	28	2·15	92
850	80	27	2·31	110
900	80	28	2·38	113
1,400	60	40	2·56	105
850	80	31	2·64	106
700	56	45	2·69	193
1,100	60	45	2·88	121
900	60	85	5·44	101

The authors describe in detail the Crompton (C.M.B.) and Thomas transmission systems, both of which have been very fully dealt with in our pages; particulars are also given of the F.R.A.M. front driven electric tractor, in which the driving mechanism is mounted on a front truck, which is pivoted vertically, and steering is effected electrically, viz., by accelerating one motor above the speed of the other, each of the front wheels being geared to a motor. A 40-cell accumulator, weighing 18 cwt., and giving 240 A.H. output, is usually fitted; the important feature of the arrangement appears to lie in its convertability, as the front truck can be readily attached to any type of vehicle, so that it may operate in turn, say, a dust cart, water cart, road sweeper, or ordinary wagon. On a later page we note that arrangements have been made for the manufacture of 1,200 pleasure cars, all fitted with the Edison battery by the Arrol Johnson Co., at Paisley.

Turning to running costs, the authors give the following table, taken from American sources:—

Load rating.	Delivery service.	Miles per day.			Comp. expenses per del. as compared with horse.		
		El.	Petrol.	Horse.*	El.	Petrol.	Horse.
Lb.					%	%	%
1,000	Suburban parcel	37	39	29	79	88	100
1,000	City delivery ...	33	34	24	93	111	100
4,000	Furniture ...	32	33	25	89	108	100
7,000	Beer	31	33	22	80	95	100
10,000	Coal	28	32	19	76	86	100

*To cover these distances by horse wagon extra horses are required.

A further table shows the cost of operating 30 electric trucks over a period of three years, the figures being those of the owners, *i.e.*, the Commonwealth Edison Co., of Chicago.

The machines vary in size, from 700 to 3,000 lb. capacity, and 19 are fitted with Edison batteries, the remainder having lead batteries.

The average cost per car-mile (about 330,000 miles being run) was 6·8 cents, made up of (*a*) oil, &c., ·7 cent; (*b*) energy, at 4 cents per KW.-hour, 2 cents; (*c*) general repairs, 1·7 cent; (*d*) tires, 1·1 cent; (*e*) batteries, 1·3 cent. The average days in service per month of each wagon were 22·6, and the average miles per day per wagon in service 30·5.

The total operating charges, including depreciation and garage charges, averaged 25·2 cents per mile.

In conclusion, we reproduce a table showing the authors' estimate of operating cost for an Edison 10,000-lb. truck in London for a year.

	Per year.	*Per day.*	*Per mile.*
Fixed Charges.	£	d.	d.
Depreciation at 10 per cent. ...	107·0	85·4	3·57
Interest at 3 per cent.	32·1	25·7	1·07
*Fire insurance at 1 per cent. ...	10·7	8·54	0·36
*Third party risk	20·0	16·00	0·66
Total	169·8	135·64	5·66
Renewal Charges.			
Battery (Edison 60-cell A 12) ...	12·0	9·59	0·40
Tires	51·5	41·20	1·72
*Chains	11·6	9·28	0·39
*Gears and sprockets	15·8	12·62	0·53
*Bearings	8·6	6·87	0·29
*All other parts	10·0	8·00	0·33
	109·5	87·56	3·66
Garage Charges.			
Electric power at 0·5d. KW.-hour	25·0	20·00	0·83
Rent, &c.	16·4	13·16	0·55
Garage labour	18·6	14·88	0·62
	60·0	48·44	2·00
Driver	75·0	60·00	2·50
Grand total ...	414 3	331·24	13·82

NOTE.—Items marked * are taken on the same basis as in America. This is not strictly just, as replacement cost is greater in the States. The mileage per day—24—is lower than need be the case, as a truck of this size can be run easily 45 miles per day in heavy work, thus reducing the depreciation account, &c.

MR. A. H. SEABROOK (Marylebone), who opened the discussion referred to the value of the electric vehicle load to central station engineers. Regarding batteries for electric vehicles, it seemed to be a question as between the lead and iron battery, of small price and big maintenance, and large price and small maintenance. There was no doubt of our being ahead in the matter of electric heating and cooking, but for some reason we lagged behind all others in the use of electric vehicles. Possibly this was due to the indifference of English battery makers, and he congratulated the authors' firm on their progressive methods. At Brighton he believed they were proposing to do away with horse traction in the municipal service on hygienic grounds. In Marylebone they had had a trial of a F.R.A.M. vehicle for street sweeping and dust collection over a period of days, and the energy used was under 1 unit per mile run. The efficiency of the battery and gear was about 65 per cent. As this was new business, it was not necessary to offer very low competitive rates for charging, and he suggested that at least 1d. per unit could be obtained for ordinary charging, while large garages would require a reduction on that. He reminded them that the lighting business still wanted watching; he reckoned that the introduction of the 16-C.P. metal-filament lamp had cost his undertaking £7,000 in 12 months in reduced revenue.

MR. W. W. LACKIE (Glasgow) said they had been testing an electric van in the municipal service for some months past. It cost £620, weighed 33 cwt. empty, and carried 1 ton; it had run from 550 to 600 miles, and the cost of energy at 1d. per unit averaged ·6d. per car-mile, which compared with 1·2d. per car-mile for fuel for a similar petrol-driven vehicle. A horse van could be hired for similar work at £14 per month, but two of them would be required to do the work of the electric van, which cost £19 per month, including 20 per cent. depreciation charge. For a year the cost of charging current at 1d. per unit would be £26, and, therefore, it was a class of business well worth encouraging; the charge of 1d. per unit was quite satisfactory for the purpose.

MR. JOHN CHRISTIE (Brighton) said the Brighton municipal

authorities were considering how they could convert 16 or 18 battery omnibuses, which had recently been taken over by the tramways, for municipal use, incidentally displacing horse-drawn carts. The 'buses provided a good charging load at 1d. per unit, and he had had no complaint as to cost in comparison with petrol vehicles. In Paris he understood the T.C. has placed orders for several hundred electrical scavenging vehicles, although the price of charging current was high there.

BAILIE SMITH (Glasgow) urged that battery vehicles should be introduced for all municipal services as a means of encouraging their general adoption.

MR. FRANK AYTON (Ipswich) thought it was necessary to come to some decision as to charging rates, and that some uniformity would be needed if cars travelled from town to town. Municipal engineers were directly concerned in the success of the electric vehicle, and he urged the M.E.A. to give a strong lead in the matter. A special committee could be formed to standardise matters with the manufacturers, and to discuss uniformity of charging arrangements. This might help the smaller municipalities to make up their minds. He gathered that in his district garage charging was likely to be a difficulty with local firms, and it might be that station engineers would have to provide facilities to commence with. The question was, how were they to start? He greatly favoured the worm as against the chain drive for the electric vehicle, and suggested that motors should be standardised.

MR. J. W. BEAUCHAMP (West Ham) said they had had numerous inquiries as to electric trucks in his area, and should certainly push the heavy van. The Corporations could easily give this business a start, if they would, in their own departments. It appeared that a revenue of, say, £23 a year could be obtained from each vehicle, charging ¾d. per unit.

MR. R. A. CHATTOCK (Birmingham) thought there was a big business in prospect in connection with the battery charging, and that 1d. per unit could be charged for this work over the whole day, but another ½d. per unit would have to be added if garage facilities were included. If it were necessary to offer a rate of under 1d. per unit, then charging hours would be restricted, and they could well afford a lower rate in such a case. He did not favour the idea of Corporations running garages, and in Birmingham the local garage people were quite prepared to provide facilities.

MR. J. SYKES discussed the question of charging rates, pointing out that charging would be mainly carried on at night when a cheap restricted-hour rate should be avilable.

MR. HOGARTH (Morecambe), referring to the petrol-driven tramway cars in use at this seaside resort, said he favoured the adoption of battery-driven cars, which could be charged during off-peak hours.

MR. F. W. CRAWTER (Chloride E.S. Co.) said he had driven an electric vehicle 25 years ago, and was much interested in them between 1885-9. He denied that the battery maker was to blame for our backward position, and thought the conditions in England were very different from those in America. Unless the electric car could make lengthy week-end runs as well as be suitable for town use, it would not supersede the petrol car for pleasure purposes; but for business purposes, and moving heavy loads, there was a great field open to the electric truck.

MR. F. S. GROGAN urged that in the matter of charging a distinction should be made between rates charged for pleasure and business cars, as the latter could be charged at pre-arranged times. He raised the question of providing battery loaning and charging stations on a co-operative basis, to provide ready charged batteries in exchange for those run down.

MR. J. E. EDGCOME (President, Kingston-on-Thames), following the last speaker's suggestion, said it would be necessary to standardise batteries and keep some in stock ready charged, and a clearing-house system would be necessary to apportion the charges to the vehicle owners who exchanged batteries. A representative Committee, say, of the M.E.A., would be required to do the preliminary spade work. He remembered some years ago considering the provision of a charging station on the Thames for river launches. He had then found out that a small competitor was charging 2s. 6d. per unit for this work, although he did not restrict himself to this rate as, on one occasion, his charge had worked out (unknown to the launch owner, of course) at a guinea for 3 units. It was not surprising that this firm had gone out of business.

MR. WM. WATSON, in a brief reply, urged that a low price should be conceded to garages undertaking battery charging. The suggested conference would do a great deal of good, as the assistance of the station engineer was necessary to obtain success. His company would always give any information or assistance in connection with the electric vehicle.

The Meeting of the "Point Five" Association (June 17th, 1913).

THE CHAIRMAN (Mr. A. S. Blackman, Sunderland), in opening the proceedings, said, as many of those present are aware, the "Point Five" Association has sprung from the suggestion, thrown out by Mr. Seabrook at Harrogate last year, to form a ½d. per unit Dining Club among the managing engineers of undertakings supplying electricity for cooking and heating at the rate indicated.

Several meetings have been held at which the dining feature has been a diminishing quantity and the technical discussions have absorbed an increasing proportion of the time; in fact, the subjects demanding urgent attention have been so many, that the last meeting was devoted entirely to the consideration of tariffs and apparatus.

The meetings of the Association have already been productive of valuable papers by the engineers responsible for the initiation of the '5 Tariff in Poplar, Southampton, Luton and Bradford, and we have avoided the trouble so many older institutions and associations experience, in obtaining papers, by changing our chairman at every ordinary meeting.

The chairman is responsible for an address, which is supposed to occupy five minutes—actually takes about 10, and frequently gives rise to a discussion lasting two or three hours.

In addition to tariffs and apparatus, selling and publicity methods, and, in short, everything pertaining to the advancement of electricity supply for domestic purposes comes within the purview of the Association.

The Tariff.—So far as private houses are concerned, electricity supply has, until recently and with few exceptions, been used for lighting purposes only, but there should be no two opinions among electrical men, that the time is now ripe for a general forward movement in the direction of making the electricity supply entirely supplant the gas service. This can, of course, only be done by the adoption of electricity for such purposes as cooking and heating, and many other domestic uses, and as the result of experience the members of the "Point Five" Association are convinced that no serious progess can under ordinary circumstances, be expected, unless electricity is sold for purposes other than lighting at not more than ½d. per unit. Where this has been done, and the sale of heating and cooking and other consuming devices energetically pushed, the load and diversity factors obtained from private houses has improved in a surprising manner.

Put shortly, the load factor obtainable from private houses is largely what the tariff makes it, provided always that the supply is pushed by an energetic sales department; and this proviso is necessary, because the applications of electricity to various household uses are continually increasing, to the benefit alike, of the load factor, the diversity factor, and the unit consumption, and heating and cooking by no means exhaust the multifarious uses which are developing, as vacuum cleaners, small motors, and other accessories account for quite a large number of units, without making their presence felt from a plant and mains capacity point of view; but in order to reap the benefit from these developments, an adequately equipped sales department is absolutely essential.

With regard to the unit charge, we, in Sunderland, tried ¾d., and as the result of a good deal of activity, a number of consuming devices were sold and put into use; the consumers were pleased with the comfort and convenience, but the cost of using was so great, that we were faced with the alternative of either letting the apparatus fall into disuse and of abandoning our cooking and heating development for the time being, or of materially reducing the unit price, which was accordingly reduced to one halfpenny.

With few exceptions, the electricity supply undertakings throughout the country are in a position to supply electricity for heating, cooking and miscellaneous domestic uses, at this price.

As evidence of the financial soundness of supply at this figure, the tariff has been for some time in extensive and growing use in places of such divergent characteristics as Poplar, Southampton, Bradford, Marylebone, Luton, Barnes, Reading and Sunderland, and, as the result of experience with the tariff, the responsible managers of these undertakings are energetically extending the use of it, and a more varied list of towns it would probably be difficult to find, so that what is proving uniformly successful in this varied group, may be said to be capable of very wide application.

An objection sometimes urged against the development of a general domestic load, under the '5 tariff, is the fear that consumers, having discovered a good thing, would come on at such a speed, that generating plant would prove insufficient, mains and services be found inadequate, and other troubles of a similar nature materialise.

It is probable that these fears largely arise from lack of experience, and it is questionable what proportion of those suffering from them, appreciate that the diversity of a heating, cooking and miscellaneous domestic load, is in the order of 20 to 1.

As regards work coming on too fast, it may be positively asserted that nothing of the kind will happen with electricity at ½d. per unit; if the rate was reduced to ¼d. per unit, or less, there would still be no fear of consumers coming on faster than the supply authority wanted them, and since a sales department was organised in Sunderland some three years ago, nothing in connection with it has impressed me more than the control a selling department gives over the development of the load.

A well organised sales department can develop, or if need be, check the load in any desired direction; and everyone with experience of the working of the '5 tariff will agree that anything in the nature of the load running away with one need not be feared for a moment. Whatever the rate may be reduced to in the future, we shall always have to go out and sell our wares.

The greatest stumbling-block to the development of electrical heating and cooking in towns which have adopted the '5 tariff, is the cost of the apparatus, and it is to be hoped that electricity supply undertakers will appreciate that the lack of a low-priced tariff throughout the country is largely responsible for the prevailing high prices.

I am only repeating a truism in reminding you that manufacturing costs are largely dependent upon quantity, and as manufacturers have at present to look for their principal market to a comparatively small number of towns, it follows that when the number of these is greatly increased, as it assuredly will be in the near future, the market for heating and cooking and other similar apparatus will correspondingly expand, and prices drop, to the advantage of all concerned.

The Mechanism.—And now just a few words with regard to apparatus. While the "Point Five" Association is doing all it can to standardise domestic tariffs, I would ask manufacturers of consuming devices and accessories, whether they cannot assist

the object we have in view, and incidentally themselves by standardising in some respects.

There are upwards of ten different spacings and diameters of 10-ampere plug pins in use, and the chaos is so great that plugs rated at the same amperage in the same house, are often not interchangeable; and matters tend to get worse, rather than better.

We talk of the convenience attendant upon electrical methods, and year after year ignore such an obvious necessity as this; and it is surely a pity that the inherent advantages of many portable domestic consuming devices should be discounted in consequence of a lack of concerted action.

Another point upon which standardisation might well be considered, is with regard to hot plates. Overall diameters, and the position, sizes, and conformation of the terminals and fixing arrangements, could surely be uniform; and the design of the hot plate the same whether for use in the top plate of a cooker, as a heating element of an oven, or as an independent piece of apparatus.

In mentioning standardisation to manufacturers, one is apt to be met with the reply that the manufacturer in question has been fully into the pros and cons of design, and that the expenditure of a considerable amount of time and money has satisfied him that his particular designs are preferable to all others, and that he would not regard it as an advantage to turn out cookers to which other makers' hot plates could be fitted.

But I ask manufacturers to consider the matter from the electricity supply manager's view point.

The position is that electricity supply undertakings will, from now onwards expend considerable and increasing sums of money upon heating, cooking and other domestic consuming devices, and accessories for hire purposes; and the quantity of apparatus that can be so placed, will very largely depend upon the rates at which it can be hired.

In arriving at these rates, considerable regard will have to be paid to the risk of obsolescence, because notwithstanding the state of reliability to which the articles in question have now attained, it will not be disputed that the near future is likely to witness further improvements, and the consequent depreciation to existing stock could undoubtedly be greatly minimised by such a measure of standardisation as would ensure interchangeability of parts.

I have been requested to say that the Association will welcome expressions of opinion, as to whether radiant or convected heat is preferable for ovens.

The question is one upon which considerable difference of opinion prevails, some people being of opinion that radiant heat is best for meat, and convected for bread, while others suggest that convected heat is better for all classes of oven work; and it would be of great assistance if settled ideas regarding the comparative value of the two heats prevailed. In connection with this point, it must be borne in mind, that an oven which may be an outstanding success in the South of England, where people, for the most part, do not bake their own bread, may be a failure in the North, where speaking generally, they do.

Following the chairman's address came an animated discussion, the first speaker being DR. FERRANTI, who dwelt strongly on the question of price, reminding those present of his efforts in the past, through the I.E.E., to induce all supply authorities to give a tariff of under 1d. per unit for all purposes other than lighting. Although he did not succeed in his endeavour, he felt that it would have been of the greatest benefit to all concerned. He congratulated the Association on its policy of offering cheap electricity for domestic purposes. It was most important to extend the scope of the Association, as a few people offering a low tariff for electrical cooking would not result in the full benefit being obtained. A general low tariff would extend the market for apparatus, and induce manufacturers to supply apparatus at low rates. What was wanted was a 24-hour load; this was a big question, and it was worth while to devise apparatus to utilise current all day and night for heat storage purposes.

MR. HORACE BOWDEN (Poplar) felt that serious attention must be given to the question of running and standing charges, also that a standard system of charging was wanted. The usual assessment charge was really settled by another Corporation department, but the assessment should depend on the cost to supply, and an ideal system would fix this for each individual.

MR. A. F. BERRY raised the question of tariff. He thought that probably more cookers were used on the 1d. rate than on the various so-called ½d. rates, which often worked out nearer ¾d. per unit. He favoured a "straight" rate, having found that to pay 1d. per unit, and know what you were paying, was better than to pay ½d. per unit and not know what you were paying. Consumers objected to having to work something out, and they must be taken into account. The question of hire rate was even more important than unit rate. English engineers produced electricity more cheaply, and yet were not doing so much as the Colonies in taking up electric cooking. The different rates for supply in various parts of London were against the interests of electric cooking, and he supported Mr. Bowden's contention, even if a flat rate were adopted. Among the 35 different authorities using his cooker, he believed there were 10 different rates of charging for supply. He concluded by urging the necessity of systematic publicity now, before it was too late.

MR. HOLMES (Marylebone) said few people realised the relation between unit charge and hire charge for apparatus. He had found that a complete electrical cooking equipment was in some cases less costly than a complete gas cooking outfit. Hire rates had been a difficulty in the past, and their experience was that maintenance could not be settled until 200 cookers were in use, after which the cost of hire and maintenance went up *pro rata*. People who bought cookers were entitled to the lowest rate, and this was an argument against decreasing the cost of hire at the expense of cost of energy. Of the electric apparatus sent out on approval in Marylebone, less than 8 per cent. was returned. A lady demonstrator was essential, especially in a good class district, to instruct in the use of the apparatus. In one house, six cooks were engaged in succession in a very short time, and each of them received instruction. Four of them in their new employment insisted on having electric cookers. In Marylebone they did not know what it was to have complaints as to cost of using electrical apparatus, and he was certain that gas and coal cooking had been put up with in the past because there was not a good substitute. It was important in heating to install large enough heaters; quite satisfactory results could be obtained, and he instanced the Delico Restaurant (in which the meeting was held), where the cost during the winter was under 10s. per week.

MR. THOS. ROLES (Bradford) referred to the success of the domestic assessment tariff in his area during the past three years; consumers and contractors both preferred it to a "straight" ½d. rate, and he could not see any complication in it. In Bradford during the year ending 1911, 106,376 units were sold on this tariff, the average price being 1·88d. per unit; in 1912, 338,590 units were sold at an average rate of 1·69d.; and in 1913, 464,767 units were sold at the same average rate. Out of 1,000 lighting consumers, 545 were on the domestic tariff, although many had no cooking or heating apparatus; they had not started hiring cookers, and the business was done in radiators and heaters. Cooking apparatus would bear improvement, and he could not conscientiously ask his consumers to hire such apparatus. Trouble with heating arose from the use of small radiators, which had been put in in the past when current was more costly than now. In Bradford they hoped to give the ½d. rate to all business premises in the near future.

MR. BELLING agreed that both radiant and convected heat were required in cooking; radiant heat was required at the start and finish for cooking either meat or bread; it did the browning while the convection heat did the general baking.

MR. HUGHMAN urged engineers who were afraid of being swamped by cheap units to draw out a scheme to achieve this end. He didn't think it could be done, and if there were any danger the sales department could adjust matters. He also urged the necessity of more energetic publicity.

MR. HAYDN HARRISON disagreed with standardisation of apparatus at the present time, although many details could be dealt with; MR. SCHOFIELD (Ferranti, Ltd.) also considered that standardisation of shape, size and arrangement of apparatus could not be carried out yet. He considered that tenants preferred to hire apparatus rather than to buy it, and that cost of hire might be included in the price of energy.

MR. F. S. GROGAN (British Electrical Transformer Co.) favoured a reduction of hire charges, which could be counterbalanced by an increased energy charge, as a low charge for energy was of little use, unless the consumer could obtain the cooking apparatus. Experience proved that this was the case, and that a low hiring rate, plus 1d. per unit, was quite satisfactory. He, too, disagreed with the suggested standardisation scheme.

MR. NAPIER PRENTICE (Felixstowe) urged that both radiant and convected heat were necessary for cooking. It was not necessary to offer such a low rate as ½d. per unit, and even hiring charges might easily be reduced too low, as he thought some of the gas companies had discovered.

A number of other speakers also took part in the discussion, to which MR. BLACKMAN replied at a late hour.

(To be concluded.)

The Cooling of Rolling-Mill Motors.—The Allgemeine Electricitäts Gesellschaft are now building single motors for driving reversing rolling mills, with outputs corresponding to 15,500 H.P. One of the difficulties that had to be met was that, owing to the necessity of keeping the diameter of the armature as small as possible, on account of the output required for accelerating the masses as well as keeping them in motion, when used to drive rolling mills in which reversal takes place frequently and very rapidly, unsatisfactory cooling conditions were set up. After many experiments, the A.E.G. have now definitely adopted the plan of cooling such motors by means of compressed air drawn from the outside. The stator of the motor is covered in on the opposite side to the commutator, except for a few small openings, the rotor being closed on the commutator side. The cooling air, which is led to the motor through filters by means of special fans, enters through an aperture in the neighbourhood of the shaft, whence it follows a predetermined course. Part of the air is forced through the core slots, part through the openings in the rotor covering, to cool the commutator, while the remainder is driven through the stator coils or through the air gap between the rotor and stator. The use of filters in connection with the arrangement has been found particularly advantageous for rolling mill service where the conditions are usually of a very unfavourable nature, as the danger of dirt entering the machine is greatly reduced, its life is lengthened, and the attendance is simplified.

Greenwich Generating Plant.—The Highways Committee of the L.C.C. reports, after considering the tenders received for the purchase and removal of certain plant at the Greenwich generating station which will not be required when the new turbines are installed, that none of these tenders be accepted. Tender forms are to be reissued in a slightly different form.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

13,834. "Thermo-electric generators." P. FERRA. June 16th.

13,844. "Electrical instruments." W. PHILLIPS and L. W. SMITH. June 16th.

13,901. "Electrolytic production of hydrosulphates." AKT.-GES. FUR ANILIN-FABRIKATION. (Convention date, July 6th, 1912, Germany.) June 16th. (Complete.)

13,903. "Methods of exciting Röntgen-ray tubes." SIEMENS & HALSKE AKT.-GES., K. BANGERT and E. UTECHT. (Addition to 9,499, 1912.) June 16th. (Complete.)

13,911. "Electromagnetic weight-lifting apparatus." MAGNET-WERK G.M.B.H., EISENACH. (Convention date, July 16th, 1912, Germany.) June 16th. Complete.)

13,918. "Electric discharge apparatus." R. MORETTI. (Divided application on 16,164, 1912, July 10th.) June 16th. (Complete.)

13,919. "Submarine electric leakage telegraphy." SIGNAL G.M.B.H. (Convention date, June 27th, 1912, Germany.) June 16th. (Complete.)

13,943. "Electrical conductors." F. EASTWOOD. June 16th.

13,945. "Rythmatic control, synchronous, differentiated or synthonic by Hertzian waves from a distance, and without relays of teledynamic machines and receivers." M. DE LEZINIER. June 16th.

13,955. "Electric browning device and heat economiser." C. W. CROSBIE, June 17th.

13,976. "Electric signalling systems." AUTOMATIC TELEPHONE MANUFACTURING Co., LTD., and H. H. HARRISON. (Partly communicated by Automatic Electric Co., United States.) June 17th. (Complete.)

13,980. "Engine-starting and lighting equipment for motor-vehicles and like purposes." H. LUCAS and W. C. TUCKER. June 17th.

13,983. "Electromagnetic sparking plug." A. SCHUBERT. June 17th.

13,985. "Ignition device." C. R. OLIVER and AUTO LIGHTER, LTD. June 17th.

13,988. "Electrical elements for cooking." R. F. VENNER. June 17th.

13,989. "Construction of electrical elements for cooking purposes." R. F. VENNER. June 17th.

13,990. "Electric apparatus for heating air." R. F. VENNER. June 17th.

13,991. "Regulator switches for resistances." B. C. BRAZIER, G. H. GOSLING and F. J. GRAY. June 17th.

14,027. "Electric striking and damping mechanism for bells, bars, tubes and plates." T. L. SOUTHGATE. June 17th.

14,034. "Apparatus for closing and interrupting electric currents." V. POULSEN. June 17th. (Complete.)

14,035. "Supplying radio-telegraphic antennæ." E. GIRARDEAU. (Convention date, June 17th, 1912, France.) June 17th. (Complete.)

14,043. "Electric controllers." SANDYCROFT, LTD., and T. M. DUTTON. June 17th. (Complete.)

14,048. "Electric incandescent lamps." ALLGEMEINE ELEKTRICITATS GES. (Convention date, September 18th, 1912, Germany.) June 17th. (Complete.)

14,049. "Electrical driving of reciprocating machinery." BRITISH THOMSON-HOUSTON Co., LTD., and G. M. BROWN. June 17th. (Complete.)

14,071. "Electric arc lamps." A. H. RAILING and A. E. ANGOLD. June 18th.

14,072. "Electro-magnetic variable-speed mechanism." R. EDWARDS. June 18th.

14,079. "Tilting arrangement for attachment to electric light shades and the like." W. SCHOLES. June 18th.

14,083. "Magnetic compasses and like instruments." E. W. BARKER. June 18th.

14,091. "Casing for pocket accumulators or dry batteries." C. R. ZUMPE. June 18th. (Complete.)

14,106. "Tools for use in applying or repairing filaments of metallic-filament lamps." C. A. HARRISON. June 18th.

14,112. "Electric switches." P. S. TURNER. June 18th.

14,115. "Electric shot-signalling device for shooting galleries, rifle ranges, and the like." FR. BURRI-BRUGGER and FR. BURRI. June 18th. (Complete.)

14,122. "Arrangements for converting continuous currents of electricity into isochronous undulatory currents." SOC. DES TELEGRAPHES MULTIPLEX. (Système E. Mercadier-H. Magunna.) (Convention date, June 21st, 1912, France.) June 18th. (Complete.)

14,140. "Apparatus for emitting heat waves." W. P. THOMPSON. (Compagnie Universelle de Telegraphie et de Telephonie sans Fil, France.) June 18th. (Complete.)

14,149. "Cut-outs for electrical instruments, glow-lamps and the like." A. J. DOWNES. June 18th.

14,167. "Machines for covering wire and other cores with yarn and the like." N. STOTT. June 19th.

14,170. "Electric light fittings of the indirect kind." O. D. LUCAS and VERITYS, LTD. June 19th.

14,188. "Electrical switches." A. P. LUNDBERG, G. C. LUNDBERG, P. A. LUNDBERG and G. PEGG. June 19th.

14,203. "Sparking-plugs." H. H. PATRICK. June 19th.

14,210. "Manufacture of earthenware ducts for electric cables." C. SHARP. June 19th.

14,214. "Automatic short-circuiting device for lightning arresters." SIEMENS & HALSKE AKT-GES. (Convention date, September 9th, 1912, Germany.) June 19th. (Complete.)

14,218. "Transmitters for submarine sound signals." SIGNAL G.m.b.H. (Convention date, June 24th, 1912, Germany.) June 19th. (Complete.)

14,229. "Telephone exchange systems." TELEPHON APPARAT FABRIK E. ZWIETUSCH & Co., G.m.b.H. (Convention date, July 5th, 1912, Germany.) June 19th. (Complete.)

14,243. "Mounting motors on electric tramcars or other rail carriages to prevent side swing." I. BULFIN. June 19th.

14,259. "Automatic speed-regulating device for the direct electrical drive of presses, shearing machines, punching machines or the like." F. R. VON MERKL. (Addition to 14,109 of 1910. Convention date, October 8th, 1912, Austria.) June 19th.

14,285. "Ships' telegraphic or signalling and like apparatus." W. CHADBURN. June 20th.

14,293. "Mariners' compasses." KELVIN & J. WHITE, LTD., and M. B. FIELD. June 20th.

14,294. "Wire-drawing machinery." N. K. TURNBULL and H. SAVILLE. June 20th.

14,306. "Switching apparatus for the inside lamps of motor vehicles." E. FREITAG. June 20th.

14,310. "Electrolytic meters." W. A. CHILDS and REASON MANUFACTURING Co., LTD. June 20th. (Complete.)

14,313. "Electric condensers, resistances, coils and the like." H. S. HATFIELD. June 20th.

14,314. "Electromagnetic instruments." H. S. HATFIELD. June 20th.

14,317. "Means or appliances for mounting and securing half-tone, electro, stereo, and zinc plates." C. F. MOORE. June 20th.

14,321. "Telephone transmitting apparatus." W. KENNEDY-LAURIE DICKSON. June 20th.

14,330. "Combined switches and plug contacts." J. P. JACOBSEN and H. F. JENSEN. (Convention date, June 21st, 1912, Denmark.) June 20th. (Complete.)

14,333. "Illuminated signs and the like." G. A. PATTERSON. June 20th.

14,380. "Stranded electrical conductors." SIEMENS, BROS. DYNAMO WORKS, LTD. (Siemens-Schuckertwerke G.m.b.H., Germany.) June 21st. (Complete.)

14,387. "Telephones phonographs, and such like apparatus." A. S. BOWLEY. June 21st.

14,390. "Dynamo-electric machines." SIEMENS-SCHUCKERTWERKE G.M.B.H. (Convention date, June 22nd, 1912, Germany.) June 21st. (Complete.)

14,395. "Electric-fluid turbines." WARWICK MACHINERY (1908) Co., LTD. (General Electric Co., United States.) June 21st.

14,407. "Automatic telegraphic apparatus." J. GELL. June 21st. (Complete.)

14,423. "Electric lamps." G. F. HITZELBERGER and NEW BRITISH EVER-READY Co., LTD. June 21st.

14,426. "Magnetic separators." F. KRUPP AKT.-GES. GRUSONWERK. (Convention date, July 19th, 1912, Germany.) June 21st.

14,427. "Magnetic separators." F. KRUPP AKT.-GES. GRUSONWERK. (Convention date, July 15th, 1912, Germany.) June 21st. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

ELECTRIC HEATING AND COOKING DEVICES. R. F. Venner. 12,569. May 28th.

ELECTRIC SEARCHLIGHTS. L. Pasqualini. 13,680. June 11th.

SIGNALLING APPARATUS. J. Moyes and C. A. Stevenson. 13,910. June 15th. (Addition to No. 5,615 of 1910.)

ELECTRICALLY-OPERATED ANNOUNCERS. A. J. W. Munden and J. M. Muir. 14,224. June 18th. (November 23rd, 1911.)

ELECTRICALLY-OPERATED ANNOUNCERS. A. J. W. Munden and J. M. Muir. 14,225. June 18th. (January 29th, 1912.)

SYNCHRONOUS PHONOGRAPHS AND KINETOGRAPHS. I. Kitsee. 14,880. June 26th.

AUTOMATIC ELECTRIC SUPPLY SYSTEM. H. Leitner. 16,174. July 10th.

ELECTRODES FOR ARC LAMPS. British Thomson-Houston Co. (General Electric Co.) 18,220. August 7th.

POLARISED TELEGRAPHIC RELAY. A. Colonna. 18,869. August 9th.

ELECTRIC FLEXIBLE CONDUCTING CORDS. M. S. Conner and J. Healey. 19,807. August 30th.

AERIALS FOR USE IN WIRELESS TELEGRAPHY. E. Girardeau. 24,345. October 24th. (October 25th, 1911.)

ELECTRIC ALARM CLOCKS. F. Goss. 26,502. November 18th.

FITTINGS FOR ELECTRIC INCANDESCENT LAMPS. T. B. Pickard. 29,736. December 24th.

PROJECTION APPARATUS. F. Dussaud. 5,424. March 4th. (March 11th, 1911.)

CONCRETE COLUMNS, AND PARTICULARLY CONCRETE COLUMNS OF TOWERS FOR WIRELESS TELEGRAPHY. J. A. Malcolm. 10,542. May 3rd.

MANUFACTURE OF INSULATED ELECTRIC WIRE COILS. L. Frenkel. 12,530. May 28th. (August 13th, 1912.)

ELECTRIC CONVEYORS OR TRANSPORTING DEVICES. Elektromoteren-Werke Hermann Gradenwitz. 12,883. May 31st. (May 31st, 1911.)

AUTOMATIC SWITCHING SYSTEM FOR TELEGRAPHY AND THE LIKE, AND APPARATUS FOR THE SAME. J. Gell. 12,847. May 31st.

TELEPHONE EXCHANGE SYSTEMS. W. Aitken. 12,973. June 3rd.

TELEPHONE SWITCHING SYSTEMS. W. Aitken. 12,974. June 3rd.

BRANCH TELEPHONE EXCHANGE SWITCHBOARDS. W. Aitken. 12,975. June 3rd.

ELECTRIC TELEGRAPHY. E. S. Heurtley. 13,155. June 4th.

ELECTRIC SIGNALLING APPARATUS. H. F. Chapman. (Chapman.) 13,208. June 5th.

ELECTRICAL MEASURING INSTRUMENTS. British Thomson-Houston Co., Ltd., and A. P. Young. 14,378. June 19th.

MEANS FOR ENSURING ELECTRIC CONTINUITY IN METALLIC CONDUITS. E. A. Edwards. 16,318. July 12th.

CONSTRUCTION OF FIELD MAGNET FOR DYNAMO-ELECTRIC MACHINES. M. A. McLean. 17,391. July 26th.

COOLING OF DYNAMO-ELECTRIC MACHINERY AND MEANS THEREFOR. Siemens Bros. Dynamo Works, Ltd., and J. W. Howard. 18,087. August 6th.

CIRCUIT-BREAKERS FOR ELECTRIC WELDING MACHINES. E. C. R. Marks. (Clinton Wire Cloth Co.) 18,109. August 6th.

ELECTRIC CRANES. British Thomson-Houston Co. (General Electric Co.) 18,746. August 15th.

CABLE CONNECTORS TO ELECTRICALLY HEATED LAUNDRY AND SIMILAR IRONS G. H. Collins and H. F. Collins. 20,776. September 12th.

HOLDERS FOR ELECTRIC INCANDESCENT LAMPS. M. J. Hoppock, jun., and A. Stout. 22,231. September 30th.

MEANS FOR DISPLAYING CHANGEABLE ADVERTISEMENTS ON VEHICLES. A. Beger. 23,824. October 18th.

MARINERS' COMPASS. W. D. Whyte. 25,028. November 1st.

SHORT-CIRCUITING DEVICE FOR THE IGNITION MECHANISM OF INTERNAL-COMBUSTION ENGINES. Firm of R. Bosch. 27,403. November 28th. (January 13th, 1912).

ELECTRIC ARC LAMPS. F. R. Boardman, R. V. Boardman and F. Boardman. 29,160. December 18th.

ELECTRIC HEATERS. L. H. Mayer. 29,569. December 23rd.

1913.

ELECTRIC ARC LAMPS. Crompton & Co., Ltd., and C. Crompton. 237. January 3rd.

RECEIVER FOR SUBMARINE SIGNALLING. Signal Ges. 1,995. January 24th. (June 1st, 1912.)

APPARATUS FOR THE PRODUCTION OF ALKALI METALS FROM THEIR FUSED HALOGEN COMPOUNDS. Elektrizitatswerk Lonza Akt.-Ges. 3,575. February 11th. (February 15th, 1912.)

ELECTRIC SAFETY-FUSE PLUG. O. Weiss. 3,782. February 13th.

MEANS FOR STARTING INTERNAL-COMBUSTION ENGINES USED ON MOTOR-VEHICLES. T. W. Tattersall. 1,206. January 15th.

ARRANGEMENT FOR STARTING GROUPS OF ELECTRICAL MACHINES, CONSISTING OF A SYNCHRONOUS AND AN ASYNCHRONOUS MACHINE CONNECTED IN CASCADE WITH IT. W. P. Thompson. (Ateliers de Constructions Electriques de Charleroi.) 5,481. March 5th. (Addition to 7,185, 1912).